

GLOBALIZATION AND ITS IMPLICATIONS FOR THE DEFENSE INDUSTRIAL BASE

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FOREWORD

The forces of globalization present challenges, risks, and opportunities to virtually every industry in every country. This includes the sector that traditionally has been more insulated from external pressures than any other—the defense industrial base. One of the most important implications of globalization is its effect on the economic competitiveness of countries and particular industries. Both governments and defense companies bear the responsibility for devising prudent policies and strategies that capture the opportunities presented by globalization, while mitigating the risks.

In this monograph, Dr. Terrence Guay explores how key elements of globalization have transformed national defense industries around the world, and how these changes will affect the U.S. defense industrial base in the coming years. He focuses on elements of globalization that are relevant especially to the defense industry: the globalization of capital (finance), production, trade, technology and labor; and the changes in global governance that structure the forces of globalization. He concludes by offering ten recommendations for policymakers who have the difficult task of maximizing U.S. economic competitiveness without compromising national security.

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SUMMARY

This monograph examines the impact of globalization on the U.S. defense industrial base. After providing a brief overview of globalization's general effects on countries and companies and the current structure of the global defense industry, the author examines how elements of globalization are shaping the strategies of defense companies. He focuses on those elements of globalization that are of particular importance to the defense industry. They include the globalization of capital (finance), production, trade, technology and labor, and the changes in global governance that structure the forces of globalization. The author concludes by offering 10 recommendations on how U.S. Government, military, and company-level policies can preserve the U.S. defense industrial base during the current era of globalization. The recommendations revolve around three themes: 1) Globalization is blurring the distinction between a domestic and foreign defense company, and policies that aim to keep this artificial distinction are not helping either national security or the defense industrial base; 2) workers are a defense company's most important asset, and policies should be designed to have the best educated and trained workers designing and building U.S. weapons systems; and, 3) the relationship between globalization and technology provides both risks and opportunities, and policies geared toward preserving a perceived U.S. advantage in technology may prove to be detrimental to both national security and economic competitiveness.

GLOBALIZATION AND ITS IMPLICATIONS FOR THE DEFENSE INDUSTRIAL BASE

INTRODUCTION

“Globalization” is perhaps the most popular term used to describe changes in the international environment since the end of the Cold War. Unfortunately, the term now is used so frequently that it has come to mean different things to different people. This lack of a precise definition of a term with wide currency can make it difficult to discuss globalization’s effects in a coherent way. However, one useful working definition of “globalization” proposed by the International Monetary Fund is “the growing economic interdependence of countries world-wide through the increasing volume and variety of cross-border transactions in goods and services and of international capital flows, and also through the more rapid and widespread diffusion of technology.”¹ While economics and technology are perhaps its most tangible characteristics, globalization also includes political, cultural, and ideational dimensions, since each of these has a reciprocal relationship with economic and technological change. This combination of forces will present challenges, risks, and opportunities to virtually every industry in every country for the foreseeable future. This includes the sector that traditionally has been more insulated from external pressures than any other—the defense industrial base. This monograph will explore how key elements of globalization have transformed national defense industries around the world, and how these changes will affect the U.S. defense industrial base in the coming years. It concludes

by offering recommendations for policymakers who have the difficult task of maximizing U.S. economic competitiveness without compromising national security. The recommendations revolve around three themes: 1) Globalization is blurring the distinction between a domestic and foreign defense company, and policies that aim to keep this artificial distinction are not helping either national security or the defense industrial base; 2) workers are a defense company's most important asset, and policies should be designed to have the best educated and trained workers designing and building U.S. weapons systems; and 3) the relationship between globalization and technology provides both risks and opportunities, and policies geared toward preserving a perceived U.S. advantage in technology may prove to be detrimental to both national security and economic competitiveness.

GLOBALIZATION

Although some would argue that features of globalization like cross-border trade and investment have been present for centuries, the proliferation of publications on globalization—both scholarly and mass market—dates to the end of the Cold War. The collapse of the bipolar international system, shaped for almost half a century by political forces, presented opportunities for numerous alternative explanations of how a post-Cold War world would be shaped. Francis Fukuyama suggested in *The End of History and the Last Man* that the ideas of political liberalism and democracy would dominate international political discourse and spread to authoritarian states.² Samuel Huntington's *Clash of Civilizations* presented a darker image of the world dividing among fault lines based

on cultural, religious, and historical ties, ultimately leading to conflict between these groups.³ But it was the economic dimension that seemed to best capture global change in the 1990s. In part, it described the attempts by formerly communist countries in Eastern Europe, the former Soviet Union, and especially China to transition to capitalist forms of economic systems. In part, it represented the increasing prominence of international organizations. The European Community (now European Union, or EU) made “EC-1992” a buzzword in many corporate suites and government offices around the world, as business executives and policymakers planned their strategies for the challenges posed by European economic integration, including the creation of a new currency—the Euro. The 1990s saw the rise of other regional groups including the North American Free Trade Agreement (NAFTA) and Mercosur in South America. Also during this period, the General Agreement on Tariffs and Trade (GATT) was transformed into the World Trade Organization (WTO). Covering a wider range of goods and services and with more authority to punish countries in violation of international trade rules, the WTO helped to accelerate international trade, while at the same time serving as a focal point for those groups opposed to both the organization’s mission and regulatory powers.

But the economic dimension of globalization perhaps is symbolized best by the expansion of production, investment, and sales by multinational corporations into other countries. According to the WTO, world merchandise exports doubled from \$1.8 trillion in 1983 to \$3.7 trillion in 1993, doubling again to \$7.4 trillion in 2003, and rising to \$10.2 trillion in 2005.⁴ Meanwhile, the Organization for Economic Cooperation and

Development (OECD), whose members consist of the world's 30 most prominent market democracies, reports that the total stock of inward investment among its members rose from \$1.3 trillion in 1990 to \$7.3 trillion in 2004.⁵ It even has became popular to rank the sales of multinational corporations with the gross domestic product (GDP) of countries, apparently (and in many ways misleadingly) suggesting that large companies were more powerful than many countries. For example, Lockheed Martin's 2005 defense revenues of \$36.4 billion were similar in magnitude to Ecuador's \$36.2 billion GDP. However, such comparisons tell us very little about the real influence of companies or their extent of internationalization.

These views of globalization—cultural, political, religious, and economic—are not mutually exclusive. In *Jihad vs. McWorld*, Lionel Barber argued economic globalization and religious and tribal fundamentalism had become the two dominant forces in global affairs.⁶ The homogenizing effects of capitalism, along with the fragmenting forces of ethnic, religious, and racial hatreds, were having the effect of undermining the nation-state and democracy. In *The Lexus and the Olive Tree*, Thomas Friedman tried to explain why some people around the world are embracing the economic benefits of globalization, particularly increasing consumerism, while others are threatened by the negative dimensions of the process, including its effects on the environment and local communities.⁷

For the purposes of this monograph, the most important implication of globalization is its effect on the economic competitiveness of countries and particular industries. Globalization's impact on the defense industry will be addressed in subsequent sections. However, there is an abundant literature aimed at

advising business and government decisionmakers how to capitalize on the globalization process. In *The Work of Nations*, former U.S. Secretary of Labor Robert Reich argued that, in an era where companies are no longer as committed to their home country, public policies need to focus on enhancing education, skills, and training in an effort to make their country an attractive location for investment by either domestic or foreign companies.⁸ Management consultant Kenichi Ohmae contended that the forces of globalization were making it less useful to talk about national economies, and that the rise of industrial clusters would make regional economies a more accurate tool for mapping global economic development.⁹ In his 2005 best-seller, *The World is Flat*, Thomas Friedman argues that the information technology revolution has reduced (perhaps even flattened) the advantages of the industrialized countries.¹⁰ An ever-increasing number of bright and educated workers, particularly in China and India, require only an internet connection to “plug and play” in the global economy. The way forward, according to Friedman, is to equip more Americans with skills that will keep them ahead of foreign competitors. Business strategists like Michael Porter contend that countries still have some key locational advantages, and that they should build upon these “diamonds” of national advantage to enhance economic competitiveness.¹¹ Finally, others such as David Baron argue that the rise of other actors has made it prudent for firms to develop nonmarket strategies to engage with governments, nongovernmental organizations (NGOs), international organizations, and other entities whose actions and decisions impact companies.¹²

To summarize, the economic strands of globalization are playing a key role in structuring the global econ-

omy. How companies in the defense industry (and their home governments) respond to these pressures is the focus of the remaining sections.

DEFENSE INDUSTRY BACKGROUND

United States.

Historically, the engine of growth for the U.S. defense industry was strong domestic demand, fueled by the Cold War. Times were especially prosperous for the industry from the late 1970s through the late 1980s. By the early 1990s, however, the defense budget was slashed in search of a “peace dividend,” and the defense industry realized that the golden years of President Ronald Reagan’s buildup were over. Military spending declined from \$431 billion in 1990 to \$322 billion in 2000 (in constant 2003 dollars), with the steepest decline coming in the mid-1990s (see Table 1). Prodded in 1993 by then Secretary of Defense Les Aspin, the industry hastened to adjust.¹³ Layoffs by firms such as Northrop, Hughes, Lockheed, General Dynamics, Litton Industries, and TRW marked a spate of “downsizings” and acquisitions, culminating in the mergers of Lockheed and Martin Marietta, Northrop and Grumman, Boeing and McDonnell Douglas, and Raytheon and Hughes. A 2003 Pentagon report found that the 50 largest defense suppliers of the early 1980s had since become the country’s top five contractors.¹⁴

	1990	1995	Percent Change from 1990	2000	Percent Change from 1990	2005	Percent Change from 1990
United States	\$431,282	\$336,635	-21.9%	\$322,309	-25.3%	\$478,177	10.9%
France	50,040	46,089	-7.9%	43,796	-12.5%	46,150	-7.8%
Germany	51,180	37,852	-26.0%	36,021	-29.6%	33,187	-35.2%
United Kingdom	51,479	43,101	-16.3%	40,533	-21.3%	48,305	-6.2%
China	12,300 ¹	14,000 ¹	13.8%	22,200 ¹	80.5%	37,700 ²	206.5%
India	10,533	10,983	4.3%	15,487	47.0%	20,443	94.0%
Israel	7,677	7,809	1.7%	9,330	21.5%	9,579	24.8%
Japan	37,668	40,483	7.5%	41,755	10.9%	42,081	11.7%
Russia	126,400 ¹	16,000 ¹	-87.3%	14,100 ¹	-88.8%	21,000 ¹	-83.4%
World	1,003,000	768,000	-23.4%	784,000	-21.8%	1001,000	-0.2%

Figures are in U.S.\$ million at constant 2003 prices, and exchange rates are for calendar year.

1. Estimate.
2. Figure is estimate for 2004.

Source: Figures derived from the Stockholm International Peace Research Institute (SIPRI), first.sipri.org/non_first/result_milex.php and www.sipri.org/contents/milap/milex/mex_wnr_table.html.

Table 1. Defense Spending of Selected Countries.

U.S. firms now dominate the global defense industry: Seven of the top ten defense companies in the world are based in the United States, including Lockheed Martin, Boeing, Northrop Grumman, Raytheon, General Dynamics, and Halliburton (see Table 2). The U.S. defense industry—or at least the aerospace and electronics components of it—consolidated quickly,

but with the strong urging of the Pentagon. Most of the mergers occurred between 1993-98, and allowed firms to either consolidate existing strengths in the defense sector or add a business with steadier revenue streams to complement their civilian side. Boeing's acquisition of McDonnell Douglas, for example, helped the company diversify into the military market. Boeing's Integrated Defense Systems business has an order backlog of over \$80 billion, more than any other defense contractor in the world.¹⁵ It has done so not simply by building military aircraft, but by becoming a prime contractor delivering integrated battle systems that link together equipment and systems used by different military branches.

US RANK	WORLD RANK	COMPANY	2005 DEFENSE REVENUE ¹	2005 TOTAL REVENUE ¹	PERCENT OF REVENUE FROM DEFENSE
1	1	Lockheed Martin	\$36,465	\$37,213	98
2	2	Boeing	30,791	54,845	56
3	3	Northrop Grumman	23,332	30,700	76
4	5	Raytheon	18,200	21,900	83
5	6	General Dynamics	16,570	21,244	78
6	8	L-3 Communications	8,549	9,445	91
7	10	Halliburton ¹	7,552	20,994	36
8	12	United Technologies	6,832	42,700	16
9	13	Science Applications International Corp. ²	5,400	7,792	69
10	14	General Electric ³	3,500	149,700	2

Figures are in U.S.\$million.

1. Defense revenue from KBR Federal and Government division.
2. For fiscal year ending 1/31.
3. Defense revenue from GE Aerospace Engines.

Source: Figures derived from Defense News Top 100 (www.defensenews.com/index.php?S=06top100)

Table 2. Top Ten U.S. Defense Companies (2005).

Since the late 1990s, major defense contractors have pursued three strategies: buying relatively small defense units from diversified U.S. conglomerates (like General Motors and TRW); acquiring defense-related businesses outside of aerospace and electronics (such as information technology or shipbuilding); or expanding abroad by buying foreign defense firms. The first strategy has been just about exhausted at this point in time. The second strategy is likely to continue to be popular, especially in a post-September 11, 2001 (9/11) world where the U.S. Government is spending considerable sums on homeland security, intelligence, and surveillance. It is the third strategy that will present the most interesting possibilities in the near-term. Larger European or U.S. companies now have acquired most of the smaller European defense firms. The next step for U.S. firms in the transatlantic market would be to acquire or merge with large European companies—a much more significant development than the ad hoc alliances and collaborations that often arise with large multination weapons systems. Since the obstacles to this strategy are formidable, other options include acquisitions of and teaming arrangements with companies outside of the North Atlantic region. While such companies typically do not have the same level of technological and production experience as European ones, other factors (as will be described below) can make this an attractive option.

Technological change plays an increasingly critical role in defense industry developments. In the post-9/11 “Global War on Terror” (GWOT) era, the U.S. Government is shifting its spending priorities in ways that emphasize information technology, intelligence, surveillance, communications, and related technologies. Since such spending requires high levels

of security, foreign firms—even European ones—are at a competitive disadvantage for Pentagon and Homeland Security contracts, even at the subcontractor level. Some defense firms are making the necessary changes to fill the needs of anti-terrorism and homeland security.¹⁶ Northrop Grumman expects its sales to the U.S. Government related to homeland security to be at least \$500 million. The U.S. Department of Homeland Security has a faster growing budget than the military defense budget, with investments expected to grow more than 10 percent each year until 2009. But most foreign firms will not be trusted to supply these needs. Still, with a 2007 budget for defense of \$439 billion, a figure larger than the combined total of the world's next 20 biggest military spenders, and weapons procurement of \$147 billion, the United States is the most lucrative market for defense companies—U.S. or foreign.¹⁷

Europe.

The rationalization and restructuring of individual European defense companies occurred after U.S. defense industry consolidation. Europe's defense industry began the 1990s as a collection of national defense fiefdoms. While the U.S. defense industry was consolidating rapidly during the first half of the decade, most European firms continued to look inward. Transnational collaborations that did exist generally took the form of joint ventures (for products like missiles) or multinational consortia (like the Eurofighter)—both of which enabled defense firms to maintain their national independence. Large-scale cross-border mergers were hindered by the reluctance of most European governments to see a domestic company acquired by a foreign firm.

By the late 1990s, this situation became untenable. Given the consolidation in the U.S. defense industry, the political impetus for a European Security and Defense Policy (ESDP) within the EU, and the fact that other sectors had begun to consolidate to take advantage of Europe's Single Market Program, European defense firms found themselves under political and economic pressure to consolidate.¹⁸ The first major consolidation occurred in the United Kingdom (UK) in January 1999, when GEC agreed to sell its defense arm (Marconi Electronic Systems) to British Aerospace. The new entity was renamed BAE Systems (BAE). Nine months later, the most significant cross-border defense union to date occurred. The first step, as in the UK, was national consolidation. As part of its privatization in June 1999, France's Aérospatiale joined with Matra to create an aerospace and defense electronics powerhouse. Four months later, this combined entity merged with Dasa to form European Aeronautic Defence and Space Company (EADS). CASA, Spain's leading aerospace and defense firm, also merged into EADS. BAE now dominates Europe's defense industry with 2005 defense revenues of \$21.0 billion (79 percent of BAE's total revenues), while \$9.1 billion (23 percent) of EADS's total \$40.5 billion total revenue comes from defense (see Table 3).

Prior to the consolidation of Europe's aerospace sector into BAE and EADS, Airbus had operated as a consortium under which the four partners (Aérospatiale, Dasa, British Aerospace, and CASA) kept ownership of their engineering and production assets. As a result of the consolidation, Airbus became owned by EADS (80 percent) and BAE (20 percent). It is important to keep in mind that the two companies are involved in both

EUROPE RANK	WORLD RANK	COMPANY	COUNTRY	2005 DEFENSE REVENUE ¹	2005 TOTAL REVENUE ¹	PERCENT OF REVENUE FROM DEFENSE
1	4	BAE Systems	UK	\$20,935	\$26,500	79
2	7	EADS ²	Multiple	9,120	40,508	23
3	9	Thales	France	8,523	12,176	70
4	11	Finmeccanica	Italy	7,126	12,728	56
5	16	DCN	France	3,352	3,352	100
6	17	Rolls Royce	UK	3,294	11,357	29
7	19	SAFRAN Group ³	France	3,075	12,528	25
8	22	Dassault Aviation	France	2,108	4,063	52
9	24	Saab	Sweden	1,941	2,427	80
10	27	OinertiO ⁴	UK	1,677	1,973	85

1. Figures are in U.S.\$ million. Currency conversions calculated using prevailing rates at the end of each firm's fiscal year.

2. At the end of 2005, EADS was 29.9% owned by DaimlerChrysler (Germany), 29.9% by SOGEADE (a French holding company comprised of Lagardère and the French state), and 5.5% by SEPI (Spanish state holding company). Approximately 34.8% of EADS shares were held by the public. In February 2007, EADS ownership was: DaimlerChrysler (15.07%); consortium of mostly German banks (7.50%); Lagardère (11.25%); French state (11.25%); SEPI (5.50%); Russian state-controlled bank Vneshtorgbank (5.40%); and 44.10% was held by the public. EADS is registered in the Netherlands.

3. In May 2005 Sagem and Snecma merged to become SAFRAN.

4. Fiscal year ending 3/31. Defense revenue is estimate.

Source: Figures derived from Defense News Top 100 (www.defensenews.com/index.php?S=06top100).

Table 3. Top 10 European Defense Companies (2005).

civilian and military business activities, and EADS and BAE sought ways to bring more defense work into Airbus. However, BAE appears to want to move into

the defense business on its own. The company's board of directors recommended in September 2006 that shareholders approve the sale of its 20 percent stake in Airbus to EADS for \$3.5 billion.¹⁹ The recommendation was approved the next month. Proceeds from the sale could provide BAE with the funds to go on a buying spree of U.S. defense companies. Similarly, other EADS owners seem to be interested in going separate ways.²⁰ In 2006, both Lagardère and DaimlerChrysler announced plans to decrease their stakes in EADS. Because of the politically sensitive nature of EADS, these reductions had to be done in such a way as to preserve the Franco-German ownership balance.²¹ By early 2007, Germany's control in EADS consisted of DaimlerChrysler's 15 percent holdings and an additional 7.5 percent stake by a consortium of mostly German banks, while France's 22.5 percent ownership was divided equally between Lagardère and the French state. But this more simplified ownership structure could be complicated by Spain, which is seeking to expand its own aerospace and defense industries. Madrid is interested in doubling its 5.5 percent ownership share of EADS, since a greater stake would justify redistributing more EADS and Airbus work to Spain.²² A new actor, Vneshtorgbank, obfuscated the situation further in late 2006 when the second largest Russian state-controlled bank acquired a 5.4 percent stake in EADS through share purchases on the open market.

While the bulk of Europe's aerospace and defense electronics sectors has consolidated into BAE, EADS, Thales, and Finmeccanica, other sectors have not followed suit. These include principally land vehicles, naval shipyards, and aircraft engines. Europe has 20 naval shipbuilders and 23 yards, while the United States has only two companies making warships (Northrop Grumman and General Dynamics) and six yards.²³

Despite the overcapacity in Europe, a result of less spending by governments on warships, consolidation has been exceedingly slow since the naval sector remains divided along national lines.²⁴ Germany's ThyssenKrupp acquired Howaldtswerke-Deutsche Werft (HDW), Germany's biggest shipyard, in 2004 and was renamed ThyssenKrupp Marine Systems (TMS). In October 2004, the French government announced plans to privatize as much as 49 percent of DCN, and began prodding Thales to merge its naval business with DCN. Such a union, then, would be in a stronger position to combine with TMS, which is now Europe's largest shipyard group. This "EADS approach" to naval consolidation still has to overcome contentious issues over ownership and which shipyards (in France or Germany) are to be closed. Other shipbuilders in Italy and Spain also would need to be coaxed into joining a Franco-German shipbuilder. Consequently, the consolidation of the naval shipbuilding sector will likely take time, despite the clear economic logic of such a move.

Demand for military vehicles has dropped sharply since the end of the Cold War.²⁵ The German military vehicles sector shrunk from 44,000 workers in 1989 to just 10,000 in 2000, while France's GIAT reduced its workforce from 17,000 in 1991 to 7,000 in 2001. Spending by the UK Ministry of Defense on combat vehicles dropped 70 percent between 1990 and 2000. While the industry has responded to the decline in demand with employment reductions, there has been little in the way of company consolidation. In fact, the number of manufacturers of light tracked vehicles worldwide actually increased from 12 to 55 between 1993 and 2003. Consolidation has gone furthest in the UK, with BAE's 2004 acquisition of Alvis Vickers (a

company produced by Alvis's acquisition of Vickers from Rolls-Royce in 2002 and of GKN in 1998), making it the only producer of military combat vehicles. In Germany, there are two main producers of land vehicles: Rheinmetall and KMW (the name given to Wegmann's acquisition of Krauss-Maffei's military operations). Finally, France's state-owned GIAT is that country's lone producer. While four land vehicles producers in three countries (and minor firms in other countries) may not seem too unreasonable, the United States, which spends far more than Europe on these types of weapons systems, has only two companies: General Dynamics and United Defense. Thus, there is an economic logic for further consolidation within Europe.

International.

Defense companies based in the United States and Europe dominate the global market. Of the 14 largest companies based on defense revenues, 10 are from the United States (see Table 2). Of the top 30 defense companies, 17 are headquartered in the United States and 11 are European (see Tables 2, 3 and 4). Of the top 60 companies, 30 are from the United States, 20 from Europe, and only 10 are based in other countries. The global imbalance is even more staggering when based on revenue. The top 10 U.S. defense companies had combined defense revenues of more than \$157 billion in 2005. The top 10 European companies had total defense revenues of \$61 billion, while the top 10 companies from outside the North Atlantic region accumulated only \$12 billion in defense sales.

WORLD RANK	COMPANY	COUNTRY	2005 DEFENSE REVENUE ¹	2005 TOTAL REVENUE ¹	PERCENT OF REVENUE FROM DEFENSE
23	Mitsubishi Heavy Industries ^{2, 3}	Japan	\$2,056	\$23,750	9
30	Almaz-Antei ⁴	Russia	1,568	1,742	90
31	Israel Aircraft Industries	Israel	1,560	2,341	67
43	Kawasaki Heavy Industries ^{2, 3}	Japan	1,103	11,249	10
45	Hindustan Aeronautics ²	India	1,053	1,170	90
46	Elbit Systems	Israel	998	1,070	93
47	Mitsubishi Electric ^{2, 3}	Japan	971	30,658	3
52	ST Engineering	Singapore	922	2,004	46
53	NEC ^{2, 3}	Japan	917	41,041	2
57	Rafael Armament Development Authority	Israel	845	845	100

1. Figures are in U.S.\$ million. Currency conversions calculated using prevailing rates at the end of each firm's fiscal year.

2. Fiscal year ending 3/31.

3. Defense revenue from Japan Defense Agency contracts.

4. Defense revenue is estimate by Center for Analysis of Strategies and Technologies, Moscow.

Source: Figures derived from Defense News Top 100 (www.defensenews.com/index.php?S=06top100)

Table 4. Top Ten Defense Companies Outside United States and Europe (2005).

Clearly, the U.S. defense industrial base dominates the global defense industry. However, on some important indicators, the U.S. defense industry may be viewed as losing ground to foreign rivals. One area is the global arms trade. Between 2001-05, the United States has been the world's second largest supplier of arms behind Russia, and ahead of the EU (see Table 5). The combined exports from the 25 EU countries comprised 27 percent of total global arms exports over this period. The U.S. market share of the global arms trade during this period was 30 percent, which is comparable to the 1980s when U.S. firms had 24-30 percent of the international arms market annually. However, it is a significant drop from the 42-60 percent market share that the United States had every year between 1991-2000, and averaging 51 percent over that 10-year period. Part of the U.S. drop can be attributed to a turnaround in the Russian defense industry, and greater exports over the past couple of years from France. Part, too, is due to a shrinking of the global arms market. The global arms trade surpassed \$40 billion each year during the height of the Cold War between 1981 and 1983. By the mid-1990s, international arms sales were barely half that level (in constant 1990 dollars). In 2000, the market fell below \$20 billion and stayed there until 2005. Between 2001-05, 40 percent of U.S. defense exports went to established markets in Europe, where defense spending has declined since the end of the Cold War (see Table 6). The upshot is that competition among defense companies for foreign sales is intensifying.

Supplier	1981	1986	1991	1996	2001	2002	2003	2004	2005	2001-2005	1976-2005
Russia ²	16,814	14,378	5,221	3,589	5,548	5,656	5,567	6,440	5,771	28,982	272,290
United States	11,797	10,229	11,641	10,377	5,516	4,662	5,139	5,818	7,101	28,236	307,469
France	3,622	2,629	902	1,651	1,133	1,259	1,268	2,514	2,399	8,573	62,657
Germany ³	1,673	1,302	2,372	1,618	640	632	1,639	837	1,855	5,603	43,456
UK	1,919	1,733	1,394	1,526	1,070	708	567	797	791	3,933	43,049
Ukraine	N/A	N/A	236	702	281	536	519	188	188	2,226	6,056
Canada	118	301	85	171	110	351	568	577	365	1,971	6,121
Netherlands	697	342	423	381	190	249	339	250	840	1,868	12,176
Italy	1,549	334	506	414	185	332	310	204	827	1,858	18,369
Sweden	172	275	184	118	459	114	271	324	592	1,760	6,507
China	825	2,143	1,100	707	408	472	428	146	129	1,583	28,092
World Total	41,997	37,241	25,928	22,079	17,332	16,139	18,248	19,834	21,961	93,514	873,991
US % of Total	28.1%	27.5%	44.9%	47.0%	31.8%	28.9%	28.2%	29.3%	32.3%	30.2%	35.2%

1. Figures are in US\$ million at constant (1990) prices.
2. Figures are for Soviet Union through 1991 and for Russia from 1992-2005.
3. Figures are for Federal Republic of Germany for 1981 and 1986.

Source: Bjorn Hagelin, Mark Bromley, and Siemon T. Wezeman, "International Arms Transfers," in *SIPRI Yearbook 2006: Armscontrol and International Security*, Stockholm: Stockholm International Peace Research Institute (SIPRI); SIPRI Arms Transfers Database (www.sipri.org/content/armstrans/accsess.html#twenty).

**Table 5. International Arms Sales:
Ranked by Top Eleven Suppliers of Major Conventional Weapons (2001-2005).¹**

Region	Country	Total
Africa		209
Americas		1,512
Asia		6,933
	Japan	1,432
	Singapore	1,165
	South Korea	1,639
	Taiwan	1,927
Europe	Greece	2,857
	Italy	1,369
	Turkey	1,318
	United Kingdom	2,374
Middle East	Egypt	2,274
	Israel	2,565
	United Arab Emirates	1,516
Oceania		1,070
Total		28,236

Figures are in U.S.\$ million at constant (1990) prices.

Source: Bjorn Hagelin, Mark Bromley, and Siemon T. Wezeman, "International Arms Transfers," in *SIPRI Yearbook 2006: Armaments Disarmament and International Security*, Stockholm: Stockholm International Peace Research Institute (SIPRI).

Table 6. U.S. Arms Sales to Selected Regions and Countries (2001-2005).

Of course, variations among home markets can account for the decline in market shares. U.S. companies, for example, have had plenty to sell to the U.S. Government, as defense spending has risen sharply since 2001 (see Table 1). Russian companies, on the other hand, are far more dependent on foreign markets, with the bulk of their arms exports going to just two countries—China (43 percent) and India (25 percent). While the U.S. Government bans arms sales to China, that country and India have become important markets

for many non-U.S. defense companies. Not only are they major importers of armaments in their own right (China and India were the world's two largest arms importing countries between 2001-05, accounting for 14 and 10 percent of all arms imports, respectively), but they are viewed as rising powers that will have a significant impact on international economics and politics over the course of the 21st century. Consequently, the United States has reoriented its relationship with India, and now is more willing to see U.S. defense firms develop collaborations with their Indian counterparts.²⁶ India, however, likely will treat such overtures with a degree of wariness, since the country has been on the receiving end of U.S. sanctions in the past, including those placed on weapons and spare parts.

Despite its growing economic importance, India was only the 43rd largest arms exporter over the 2001-05 period. China ranks 11th, but that is much lower than its standing in the 1980s, when its arms exports were comparable to France, Germany, and the UK. Both countries expect to improve in this area in the coming years, as economic development and the diffusion of technology are expected to help domestic companies produce more sophisticated armaments that have wider appeal in global markets.

While there are few companies in the world that can match the revenues of U.S. defense firms, globalization is forcing companies to rethink their international strategies in ways that may make U.S. companies more foreign and international companies more American. This theme is dealt with more fully in the following sections.

GLOBALIZATION AND FINANCE

Clearly, one of the most significant dimensions of globalization is the ability to move money to almost anywhere in the world at high speed. As countries have removed capital controls, investors large and small have more freedom to send their capital abroad and invest in foreign markets. The defense industry is not immune to this trend. Of the five largest U.S. defense companies, Northrop Grumman has the largest share of foreign ownership, with about 7.5 percent of its stock held by foreigners. Lockheed Martin follows with 7.2 percent, Raytheon at 4.6 percent, General Dynamics at 3.5 percent, and Boeing at 7.8 percent.²⁷ Many of these shareholdings are owned by foreign mutual funds, presumably on behalf of smaller investors who have capital invested in the funds. U.S. defense companies are among the least international in terms of foreign ownership, although state-held firms in Russia, China, and elsewhere often are even less so. European companies, however, often have large blocs of foreign ownership. Foreign shareholdings of BAE, for example, have fluctuated around 45 percent in 2006, but were as high as 59 percent in 2003.²⁸

The finance dimension of globalization has facilitated the ability of companies to list their shares on multiple stock exchanges. DaimlerChrysler became listed on the New York Stock Exchange (NYSE) in 1998, thereby meeting a goal to have access to a larger pool of investors. BAE also is considering a NYSE listing. Similarly, in June 2006, EADS announced it was seeking a listing on the Xetra Dax index of Germany's Deutsche Borse, which would add liquidity to the stock and give it greater exposure to investors.²⁹ These moves also can increase financial transparency, as companies fulfill the

requirements set by different stock exchanges, which is an attractive feature for some investors.

Such trends in foreign portfolio investment, however, are more than matched by cross-border flows of foreign direct investment (FDI), which have exploded over the past decade (see Table 7). According to the Organization for Economic Cooperation and Development (OECD), an international organization comprised of the world's 30 most developed economies, FDI flows have increased dramatically since the early 1990s. FDI outflows from OECD members rose from about \$200 billion annually between 1990 and 1993 to \$410 billion by 1997, \$652 billion in 1998, over \$1 trillion in 1999, and more than \$1.2 trillion in 2000.³⁰ Outflows have dropped sharply from the 1999-2000 boom years, but have been over \$600 billion each year from 2001-05. Similarly, FDI inflows among OECD members passed \$200 billion for the first time in 1995, rising to \$894 billion in 1999 and just under \$1.3 trillion in 2000, before stabilizing in the \$500-600 billion range in each of the past 5 years. The stock of inward investment among OECD countries was estimated to be about \$7.3 trillion in 2004—a huge jump from \$1.3 trillion in 1990. FDI has a tremendous impact on the recipient country's economy. In 2004, U.S. affiliates of foreign (majority-owned nonbank) companies employed 5.1 million Americans, contributed \$515 billion to U.S. GDP, and accounted for 19 percent of U.S. exports and 26 percent of imports.³¹

	Cumulative FDI Inflows, 1996-2005	Cumulative FDI Inflows, 2002-05 ¹
<u>OECD Members</u>		
United States	1,540	391
United Kingdom	653	262
Germany	425	100
France	403	187
Netherlands	313	91
Canada	228	65
Spain	225	113
Mexico	164	69
Sweden	157	25
Italy	115	67
Japan	60	26
<u>Non-OECD Countries</u>		
China		239
Hong Kong		93
Brazil		60
India		22
Russia		42

Figures are in US\$ billion

1. Figures preliminary for 2004 and estimated for 2005

Source: Organization for Economic Cooperation and Development, *Trends and Recent Developments in Foreign Direct Investment*, June 2006

Table 7. Foreign Direct Investment Flows, Selected Countries.

While FDI is expanding at a rapid pace for many companies, defense firms in general have been latecomers to this process. The United Nations

Conference on Trade and Development (UNCTAD) ranks the transnationality of companies based on their foreign assets, sales, and employment as a percentage of the company's totals in these areas. Interestingly, under UNCTAD's measure, only two major defense companies rank among the world's top 100 nonfinancial transnational corporations—BAE Systems (ranked 17th) and United Technologies (ranked 49th). Although this measure does not take into account a company's global supply chain, it should not be too surprising that defense companies, which long have focused on their relationship to their home government, have a much higher percentage of their assets, revenues, and employment based in their home country. Nonetheless, the trend for virtually all defense companies in the United States and abroad is to extend their international operations. Consequently, the remainder of this section focuses on aspects of FDI that are of particular importance to the defense industry.

Mergers and Acquisitions.

The globalization of capital has contributed to the growth in cross-border mergers and acquisitions (M&A) in nearly every sector, including defense. In many OECD countries, they account for more than half of total FDI. Cross-border M&As to and from the 30 OECD countries amounted to \$1.3 trillion in 2005—far more than the \$281 billion in 1995 (see Table 8).³² Global M&A activity (i.e., accounting for OECD and non-OECD members) was estimated to total \$1.9 trillion for the first half of 2006—the highest half-year volume on record, including the dotcom boom in the 1990s.³³ Many of the deals have been financed with cash

reserves, including two-thirds of those occurring in the first quarter.³⁴ This is one consequence of the cost-cutting and balance sheet strengthening that companies have undergone as a result of increasing international competition. Much of the M&A activity, particularly in Europe where deals have outpaced the United States in 2006, is within industries. Such “horizontal integration,” which seeks to build efficiencies through cost-cutting and economies of scale, has been slower to come to Europe. But 2006 has seen Germany’s Eon bid €29 billion for Spain’s Endesa in the utilities sector, and Enel of Italy seek to acquire the water and power company Suez of France (effectively blocked when the French government persuaded Gaz de France to merge with Suez instead). Increasing integration within the EU, including the restructuring that was expected with the introduction of the Euro, is helping to spur this M&A activity.

	Outward	Inward
1995	134.1	146.5
2000	1,166.4	1,135.8
2003	321.3	337.8
2004	418.8	441.3
2005	670.8	626.9
Estimate 2006	566.9	554.3

Figures are in US\$ billion.

Source: Organization for Economic Cooperation and Development, *Trends and Recent Developments in Foreign Direct Investment*, June 2006

Table 8. Cross-Border Mergers and Acquisitions to and from OECD Countries.

Within the defense industry, there is more opportunity for M&A activity in Europe than in the United States. As described earlier, much of the consolidation of the U.S. defense industry was completed by the mid-1990s. There was not much significant movement in Europe until the late 1990s. The first wave of consolidations led to British Aerospace's acquisition of GEC and the formation of EADS through the uniting of French, German, and Spanish aerospace companies. It is very likely that a second round of M&A activity is about to begin. Europe's land vehicles and shipyards are ripe for consolidation, and EADS has made overtures to Thales. A union between these two companies would give EADS a dominant presence in defense electronics, but Thales has resisted these overtures, despite encouragement from French Defense Minister Michèle Alliot-Marie to create a single European satellite maker.³⁵ However, there is industrial (and political) logic to the unification of Thales with Italy's Finmeccanica, since both companies have closer relationships to the Pentagon and UK Defense Ministry than does EADS. Other companies are restructuring in preparation for M&A activity. In early 2006, MBDA, Europe's leading missile maker and co-owned by EADS (37.5 percent), BAE (37.5 percent), and Finmeccanica (25 percent), announced plans to cut 10 percent of its staff prior to embarking on a fresh wave of cross-border consolidation.³⁶

While still small when compared to the number of mergers among U.S. companies, there have been significant transatlantic deals that have been facilitated by increased capital mobility. In March 2005, BAE agreed to buy the U.S. combat vehicle and armaments manufacturer United Defense Industries for \$4.1 billion.³⁷ The largest acquisition in BAE's

history, financed in part by the sale of stakes in several European joint ventures (including those with Finmeccanica and Saab) worth about \$1.9 billion, made the company's U.S. arm the fifth-largest defense firm in the United States. Ironically, this deal came a year after BAE thwarted General Dynamics' attempt to acquire the UK armored vehicle maker, Alvis, by offering a higher bid, thereby engineering a national rather than transatlantic consolidation in land vehicles.³⁸

Defense industry M&As have followed a distinct pattern. The first phase consisted of regional mergers (first in the United States, followed by Europe) that led to the formation of large companies in the defense aerospace and electronics sectors. The second phase appears to be unfolding in two ways: consolidation in the land armaments and naval sectors, as well as large firms buying smaller ones on the opposite side of the Atlantic Ocean.

But it is talk of a big transatlantic aerospace and defense industry merger that has captured the imagination of many executives and government officials. Perhaps the most attractive European firm from the U.S. perspective is BAE. General Dynamics, Boeing, and Lockheed Martin all have negotiated with BAE, but the deals fell apart when BAE refused to sell its profitable and fast-growing North American operations.³⁹ BAE sells more to the U.S. Government than any other non-U.S. company, which would make it a valuable acquisition for a U.S. defense contractor. BAE Systems Inc., the U.S. subsidiary, has seen its sales grow 250 percent in 5 years, and has made more than a dozen acquisitions since 2000.⁴⁰ The U.S. subsidiary also employs 45,000 of BAE's 100,000 workers.⁴¹ In fact, BAE is trying to be so "American" that it is on track to be one of the top 20 corporate donors in the current

U.S. election cycle.⁴² Yet, while the U.S. defense market is extremely important to BAE, so are the European defense and civilian markets. With the recent sale of its 20 percent stake in Airbus, it will be more difficult for BAE to claim that it is both a European and North American company. Publicly, BAE claims that it is not interested in selling its North American business unit. Certainly, a U.S. firm could make an offer that BAE reasonably could not refuse, but negotiations by Northrop Grumman and Boeing have yielded no results and the premium that BAE would demand is too costly for any U.S. company at this time.

Foreign Investment and Protectionism.

While much of the evidence suggests that FDI and M&A activity is on the rise, there are concerns that global financial flows are facing politically-motivated obstacles. In many cases, national security is being raised as an excuse to prevent acquisitions. This was evident in early 2006, when several high profile mergers were opposed by European national authorities, including Mittal Steel's bid for Arcelor and the utilities deals mentioned above.

Some European governments are implementing measures to make defense industry companies more difficult to acquire. The 2002 acquisition of the German shipyard Howaldtswerke Deutsche Werft (HDW) by One Equity Partners (OEP), a U.S. institutional investor, led to fears of a sell out of the German arms industry. These fears were ameliorated somewhat in 2004, when HDW was merged with the shipyards of Thyssen Krupp, with OEP's stake reduced to 25 percent. However, rules for foreign ownership of defense-related companies were tightened in 2004

and 2005 to stipulate that the acquisition of more than 25 percent of the voting rights in a German company producing armaments, ammunition, or cryptographic programs has to be reported to the Federal Ministry of Economics and Labour.⁴³ The Ministry then has the right to prevent the investment if necessary to safeguard “important security interests.” The list of covered activities was expanded in 2005 to include companies producing and developing engines and gear systems for tanks and similar armored military vehicles. In December 2004, the French government presented 11 sectors (including: businesses relating to certain dual-use items and technology; cryptology services; weapons, munitions, and explosive substances for military purposes; and activities involving design or equipment supply contracts with the French Defense Ministry) for which foreign investment would require government authorization. Under the new rules, prior authorization is needed for investment not only in arms manufacturing, but in all companies operating in “the interest of national defense.” Russia, too, is in the process of drafting legislation regarding the protection of strategic sectors from foreign ownership. The proposed law would cover a few closed sectors and contain a list of approximately 39 sectors, including arms and defense-related sectors as well as nuclear energy and aerospace industries, in which foreign investors would need government authorization to acquire more than 50 percent ownership.

The United States also is showing increasing signs of protectionism with respect to FDI. In 2005, China’s national oil company CNOOC sought to acquire Unocal, but withdrew its bid once vociferous opposition was mounted within the United States. In early 2006, Dubai Ports World (DPW), a ports operator

based in the United Arab Emirates, sought to acquire British-based P&O. The acquisition, which would have placed six U.S. port terminals under DPW, faced even greater criticism from Congress and a large segment of the public. Much of the criticism was targeted at the Committee on Foreign Investment in the United States (CFIUS), the secretive inter-agency panel that reviews deals for potential national security problems. In response to the DPW controversy, Congress has sought to revise the procedure for reviewing foreign acquisitions of U.S. companies for security purposes, with House and Senate committees passing rather different bills in spring 2006. Among the proposals are the development of a secret ranking system based on a country's relationship with the United States, including each country's adherence to non-proliferation control regimes and potential for trans-shipments or diversions of militarily sensitive technologies, and more Congressional oversight over CFIUS investigations.⁴⁴ Business groups, including the Organization for International Investment (OFII), which represents U.S. subsidiaries of foreign companies, have lobbied Congress to not make regulations so stringent that the United States becomes an unattractive location for foreign investment.⁴⁵ U.S. Secretary of Homeland Security Michael Chertoff suggested that the emotional response to the acquisition threatens to damage the country's economy.⁴⁶ Likewise, U.S. Treasury Secretary John Snow and Bruce Josten, Executive Vice-President at the U.S. Chamber of Commerce, expressed concern that the reaction by lawmakers would send a signal that foreign investments from certain parts of the world, particularly the Middle East, are not welcome.

In an era of ever-increasing cross-border deals, the issue of whether national security will be adversely

affected by the acquisition of U.S. assets will become more prominent. In March 2006, France's Alcatel reached an agreement with US-based Lucent to merge the companies. While EU regulators and the U.S. Department of Justice and Federal Trade Commission (FTC) have approved the \$36 billion merger, the CFIUS has yet to give its opinion. This merger does have a significant national security dimension, since one of Lucent's subsidiaries is Bell Labs, which has done much work in ballistic missile technology, submarine sonar, and communications satellites. The French government had similar concerns about Alcatel's sensitive military contracts, which were relieved when the company's satellite business was acquired by Thales in exchange for €1.7 billion and an increase in Alcatel's stake in Thales to 21.6 percent.⁴⁷

Toshiba's proposed acquisition of Westinghouse will be scrutinized since the combined entity would be the world's largest nuclear power company. The scrutiny is in part due to the Japanese company's tarnished reputation in U.S. security circles. Toshiba got into trouble in 1988, when the United States banned U.S. Government procurements of Toshiba products and banned imports of products from a Toshiba subsidiary for selling submarine-silencing equipment to the Soviet Union in violation of an international agreement among countries, including Europe, the United States and Japan, to keep high-tech equipment with military uses out of the communist bloc.⁴⁸ One consequence of the DPW case is that companies may now believe their deals must get approval from a broader range of national and state politicians, including key members of Congress as well as governors, since approval from formal channels (i.e., CFIUS, Department of Justice, and FTC) may not be sufficient.⁴⁹

Such actions in the United States and elsewhere prompted the OECD, in its 2006 report on trends and recent developments in FDI, to conclude that, “[w]hile many developing and emerging economies continue to take steps to open their economies to international participation, the international security situation and fears of negative consequences of globalization have prompted the governments of several OECD countries to review their FDI regulations. . . . Without contesting sovereign nations’ right to regulate, there is a risk that regulatory action may sometimes exceed what is needed to safeguard essential interests and be motivated by protectionist motives.”⁵⁰ Care, therefore, must be taken to ensure that FDI even in defense and defense-related industries is not deterred unless the national security screen has met the highest standard.

Political obstacles exist on the European side as well, particularly in areas like shipbuilding and land vehicles. Before being acquired by BAE, United Defense reportedly presented a takeover bid to Germany’s Rheinmetall, while General Dynamics was interested in purchasing the 49 percent stake in KMW held by Siemens. However, the German government opposes takeovers of German military vehicles producers by U.S. companies.⁵¹ Additionally, the ownership structure of the military vehicles industry in Germany and France makes international acquisitions difficult. Two families hold controlling stakes in KMW and Rheinmetall, which serves to prohibit hostile takeovers and reduce the pressure for maximizing shareholder value. In France, state-ownership makes the acquisition of GIAT all but impossible. Only BAE is a serious player in transatlantic mergers in the land vehicles area, and it emphasized this position with its acquisition of United Defense. With General Dynamics the only U.S.-

owned producer of land vehicles, it is unlikely that the Pentagon would permit the company's takeover—even if there were a European company with whom such a merger would make strategic sense.

Privatization.

Another trend stimulated by globalization and which impacts foreign investment is the privatization of assets formerly held by governments. While this trend has affected companies in virtually all industries, it has been somewhat slower to come to the defense industry, which is not too surprising given the delicate relationship of this sector to national security. Nonetheless, European governments started to privatize segments of their defense industry in the mid-1990s, shedding control over some defense companies partly to meet the financial criteria of the EU's common currency, and partly due to ideological changes that were shaped by increased international competition.

The trend has since progressed to other countries, with the case of India presenting both opportunities and challenges for U.S. defense companies.⁵² In March 2006, India appointed private sector Indian companies as prime contractors for rocket launchers. Until now, defense integration work has been done by government corporations or by overseas suppliers. About 70 percent of India's defense capital budget is spent abroad because of the limitations of its public sector, and because FDI in private sector defense companies was banned until 2002. However, the government decided in 2005 that 30 percent of the value of foreign defense contracts over 3 billion rupees (about \$66 million) should be offset by purchases, investments, and technology transfer

to India. The objective is to persuade foreign defense contractors—especially U.S. companies—to engage in joint ventures, which in turn would boost India's defense exports. The strategy is seen as a way for India to build on the success of its information-technology outsourcing companies.

The approach seems to be working. EADS plans to invest \$2 billion in the country over the next 15 years, primarily through a technology center to house Engineering Centre Airbus India, which will focus on high-end engineering design and analysis.⁵³ Additionally, EADS has partnered with the Indian Defense Avionics Research Establishment to develop a missile warning system for the Indian Air Force, and with Antrix (the commercial arm of the Indian Space Research Organization) to jointly develop communications satellites.

In the United States, privatization has taken the form of outsourcing, that is hiring private companies to undertake work previously done by the military. Outsourcing picked up speed in the 1980s, when the Reagan Administration sought to privatize a range of government functions, and continued in the 1990s, as the Clinton Administration outsourced food, transportation, and other services as part of its strategy to shrink the military. But it is the Bush Administration that has moved furthest in this area, with payments to contractors for providing food, shelter, security, and other services rising from \$53 billion in 2000 to \$104 billion in 2004.⁵⁴ According to the Congressional Research Service, of the approximately \$365 billion spent on the Iraq war and fight against terrorism since late 2002, about \$60 billion (16 percent) has been paid to contractors for services. Controversially, oversight safeguards were lifted prior to the Iraq war,

including the Department of Defense's (DoD) ability to circumvent competitive bidding rules in emergency situations. Consequently, sole-source and other non-competitive contracts awarded by the Pentagon have increased 54 percent since 2000, from \$65 billion to \$100 billion. Although instances of fraud and waste are prevalent, including a finding by Defense Department auditors that Kellogg, Brown & Root (a Halliburton subsidiary) had billed the government \$1.2 billion for questionable charges, a Congressional Budget Office study suggests that outsourcing is still a net benefit for the Pentagon.

The liberalizing forces of privatization have had mixed effects around the world. While the United States has moved toward more subcontracting of previously government operated services, and some European countries have sold off state defense assets, other countries have been slower – even reluctant – to initiate such actions. Indonesia's parliament in 2004 passed a bill requiring the country's powerful military, known as the TNI, to divest all the businesses it controlled within five years. However, by the summer of 2006, the government had resigned itself to the fact that only six or seven of the TNI's 1,500 businesses would be sold off.⁵⁵ Amnesty International has singled out China for selling a considerable amount of conventional weapons and small arms to repressive regimes and parties involved in civil wars.⁵⁶ Many of the companies involved in the arms trade are companies established by the People's Liberation Army and the police state agency, which benefit from the revenues.

The privatization and liberalization pressures of globalization also have their limits when they confront government-led industrialization strategies. In February 2006, Russia merged all of the country's

aircraft manufacturers (including Tupolev, Ilyushin, and Mig) into one state-run holding company (the government intends to retain a 75 percent stake) to be called Unified Aircraft Corporation (UAC).⁵⁷ The new company will also incorporate Irkut, a publicly traded company that is partly owned by EADS. Reflecting the multidimensionality of globalization, Russia is also looking outward to develop strategic ties with foreign partners. Airbus is in talks with the Russian government to create a \$25 billion “life-time” partnership that would include developing new aircraft, ordering parts for the A-350 airliner, converting passenger jets to carry cargo, and financing a new-generation aircraft program. Although the Russian government, as mentioned above, views aerospace as a strategic sector, it presented legislation that would loosen restrictions on foreign participation in aircraft projects, including up to 49 percent ownership stakes (up from the present 25 percent limit).⁵⁸ This is characteristic of Russia’s current economic development strategy, which typically begins with domestic industry consolidation with significant government influence over the new entity, and then is followed by an opening to foreign partners with minority stakes. The hope is that domestic consolidation, followed by foreign investment and technology transfer, will revive an aerospace industry that made one-quarter of the world’s aircraft during the Cold War years, but has since faltered (the export of some MiG and Sukhoi military aircraft notwithstanding).

Production.

Another important dimension of globalization is a more complex level of international production. One

of the motivating factors for companies to expand FDI is to have access to sources of production in multiple locations. The reasons are both economic and political. Companies, searching for a different mix of workers, new markets, and technological developments, are more willing to manufacture parts of their products abroad. One benefit is reduced costs, since producing some or all of a product abroad may give firms cost advantages vis-à-vis their international competitors. While international economic competition is driving most of this process, politics also plays a key role in some sectors, particularly those that provide opportunities for producing higher value-added goods, technology transfer, good paying jobs (relative to what domestic firms typically pay), and higher levels of exports. Additionally, and especially pertinent to defense firms, production abroad may be necessary to win contracts and sell products in other countries. The defense industry, and those sectors related to it like aerospace, electronics, and information technology (IT), is among the more prominent sectors that are driven by these forces. While multi-nation weapons projects originated in the 1960s, and were motivated primarily (but not exclusively) by political reasons, the scale, cost, and complexity of such programs today make cross-border collaborations an economic necessity.

One example is the Galileo project—a joint undertaking by the EU and the European Space Agency to be Europe's alternative to the U.S. Global Positioning System (GPS).⁵⁹ Galileo was given the go-ahead in May 2003 by European governments who agreed to fund the €3.2 billion project. The target is to have 27 satellites fully operational by 2008. However, Galileo is not a solely European project, as China has agreed to invest €200 million in the collaboration,

and India and Israel among other countries are also lobbying to participate. Such countries are barred from collaboration on GPS since it is largely a military system run by the Pentagon. The EU views Galileo as a move away from dependence on the Pentagon's GPS, and a step towards a common defense. It is telling that non-European countries have been included in, or may yet join, Galileo. Their involvement reduces funding requirements from European defense budgets. The U.S. GPS system is closed to outsiders for security reasons. Corporate participants in Galileo include EADS, Thales, Alcatel (France), Inmarsat (UK), Finmeccanica, Aena (Spain), and Hispasat (Spain) in Europe, plus companies from a dozen other countries.

But the aerospace industry is perhaps the most competitive when it comes to developing an international production base. Aerospace is leading other segments of the defense industry in developing a global base of production. Boeing and Airbus, the world's two dominant aerospace companies, seem to regard the world as their playing field, and as the United States and Soviet Union did during the Cold War, they are fighting economic proxy wars through third parties.

While civilian aircraft outsell the military variety, there are technological spillovers that are increasingly going from the civilian to military direction. Both companies experienced their best order year in 2005, and the growth of developing countries played a major role.⁶⁰ In 2005, Airbus booked 526 plane orders in Asia valued at \$39.4 billion, while Boeing sold 381 planes valued at \$45.5 billion. China alone agreed to purchase 150 aircraft from each company. Carriers in China, India, and other Asian countries accounted for more than 40 percent of the 2,057 airplanes that Airbus and

Boeing booked. Airbus believes Asian airlines will be the biggest buyers of large aircraft by 2023, and Boeing thinks China will be the second biggest market (after North America) over the next 20 years. By the early 2020s, China may make up 60 percent of orders for planes seating more than 450 people. Rising incomes in China and India have sparked a demand for more air service, and Beijing's hosting of the 2008 Olympics is expected to accelerate tourism to China. China's air traffic is expected to grow 8.8 percent annually through 2024, and India's is projected to grow 25 percent yearly through 2010. Clearly, during the first half of this century, Asia will be of utmost importance to Airbus and Boeing for economic reasons, as it also will be for Europe and the United States for geopolitical ones.

Airbus and Boeing have found that they have to work with national governments in such key markets. The globalization of the aerospace industry has brought new players to the industry. Because a 1992 agreement between the U.S. and European governments limited the subsidies Boeing could receive in the United States, the company searched abroad when it began development of its new 787 Dreamliner. Japan has long sought to develop a greater presence in the aerospace industry.⁶¹ Since the 787 project was an opportunity for Japan to develop a major stake in the plane's development, the Japanese government provided \$1.6 billion of repayable launch aid (like Airbus gets in Europe). Consequently, Boeing can now share the risk of this new model with Mitsubishi, Fuji, and Kawasaki, as the three Japanese companies will collaborate in designing the wings-fuselage interface.⁶² In return, about a third of Boeing's 787 aircraft will be built in Japan. For Boeing, doing more production abroad helps to win orders. In the 1960s, only two percent of the content of

Boeing's 727 was non-American. By the mid-1990s, this had increased to 30 percent in the 777 model. Going forward, at least 70 percent of the 787 Dreamliner will be built outside the United States, mostly in Japan.⁶³

Airbus has not given up on Japan, even though its market share there is only 1-2 percent. In February 2005, the company appointed a new head for its Japanese unit and vowed to break Boeing's monopoly in the world's second largest civil aviation market, aiming for a 50 percent market share by 2010.⁶⁴ Given these obstacles, Airbus is responding to Boeing's seeming stranglehold on the Japanese airline market and is cooperating with that country's aerospace industry with a wider Asian strategy. Airbus executives envision the transformation of Airbus from a European champion to a global company that can challenge an increasingly global Boeing.⁶⁵ Given Boeing's strategy of building ties with major Japanese companies, a plausible Airbus response would be to develop alliances in China. The company already has a joint venture there (an engineering center with a local aircraft manufacturer), and the Chinese have been offered a five percent risk-bearing share of the new A350 model (designed to compete with Boeing's 787). Airbus foresees similar collaboration with local partners in India and Russia, both of which are expected to experience strong growth in air traffic in coming years.

Given the stakes involved in the Boeing-Airbus rivalry, in terms of market share, exports, technological innovation, and prestige, it is not surprising that government officials in the United States and Europe are working on their respective aerospace company's behalf in Asia and other markets. U.S. Government officials and their European equivalents play an active role lobbying on behalf of their company. In early 2005,

Britain, France, and Germany placed political pressure on Poland to buy Airbus aircraft valued at about \$500 million for its state-owned carrier Lot.⁶⁶ The leaders of each country at the time (Tony Blair, Jacques Chirac, and Gerhard Schroder, respectively) made the case to the Polish government that the decision would be an implicit test of the country's European credentials. In the end, under heavy pressure from U.S. officials, Poland chose to purchase seven Boeing 787s. By the end of the year, after even heavier lobbying by European officials, Airbus closed a deal to sell 150 A320 aircraft (worth almost \$10 billion) to Chinese airlines, more than the 70 planes (listed at about \$4 billion) that Boeing sold.⁶⁷ Such intensive lobbying efforts are not always successful. The French government has been unsuccessful in persuading Norway, the Netherlands, South Korea, or Singapore to purchase the Dassault-built Rafale fighter aircraft.⁶⁸

The Europeans even are trying to build an aerospace presence in the United States. According to EU trade commissioner Peter Mandelson, the Airbus superjumbo A380 will likely have more U.S.-built components than the Boeing 787.⁶⁹ He also has claimed that Airbus buys about \$6 billion worth of U.S. goods a year, supporting 140,000 jobs in 40 states. Airbus, in an effort to improve its image in the United States, took out a full two-page advertisement in the May 7, 2004 *Washington Post*. Titled "America is on board the A380," the advertisement listed hundreds of U.S.-based suppliers, highlighted the economic impact of Airbus in the United States, and stated that U.S. companies will produce half of the Airbus A380. Despite Boeing's dominance in the United States, the U.S. defense market is very attractive to Airbus, and EADS even plans to build a factory in Louisiana to build air-refueling tankers, should it win

an Air Force contract.⁷⁰ If this project goes forward, Airbus would supply “green aircraft”—completely unequipped A330s assembled in Toulouse, which would be fitted out at the U.S. plant.⁷¹

The intense rivalry between Airbus and Boeing presents opportunities for other firms to play this to their advantage. Italy’s Finmeccanica has pursued such a strategy to its benefit. According to the *Wall Street Journal*, “Finmeccanica . . . reflects the increasingly global aerospace industry, where international partnerships abound and rivals are interlaced through common suppliers.”⁷² For example, the Italian company supplies Boeing with components for the 787, works with Lockheed Martin and Northrop Grumman on the Joint Strike Fighter, and collaborates with Lockheed Martin and Textron’s Bell Helicopter unit on the Marine One fleet of presidential helicopters. Finmeccanica also partners with Airbus on the A380, with BAE and EADS on the Eurofighter, with France’s Alcatel on satellite and space products, and with BAE and EADS on missiles. But the strategy of trying to develop close relations with both Boeing and Airbus does carry risks. Part of the EU’s response to the WTO case filed by the U.S. (discussed below) is that the Italian government provides aid to Boeing projects through Finmeccanica. Attempts by Airbus and EADS to bring Finmeccanica into a tighter relationship, including offering the Italian company a ten percent stake in Airbus in 2000, have not been successful.

U.S. defense companies that are more reliant on defense sales, such as Lockheed Martin, Northrop Grumman, Raytheon, and General Dynamics, are not under the same kind of pressure to expand their international production base as are Boeing and Airbus. Their international strategy tends to take the

form of collaborations that, for political and economic reasons, allocate development and production among companies from different countries. While such collaborations are almost entirely between North American and European companies, this may change as other countries (thanks to Boeing and Airbus) develop greater capabilities in aerospace technology and production.

For investment reasons already discussed, and labor reasons that will be outlined below, product supply chains now integrate multiple countries. The globalization of production is, in part, a response by firms to lower costs in an increasingly competitive marketplace. Host countries see many opportunities from attracting FDI, and the increasing “statelessness” of multinational corporations makes production in a variety of countries a necessary strategy. Boeing is a good example of a U.S. defense company that has developed increasingly intricate global supply chains. Boeing used to design and engineer all of its aircraft models itself. But with the new 787 Dreamliner, Boeing has scoured the world to find the best possible suppliers (or “partners” in the upgraded terminology).⁷³ Boeing’s new global partners number just under 100, far fewer than the 500-700 utilized in the 777 aircraft; but each has a much higher degree of responsibility for their portion of the work, as well as the overall project. Similarly, Airbus counts 18,000 suppliers in 30 countries (including 100,000 workers in the United States) involved in the construction of the A380 superjumbo aircraft.⁷⁴

Boeing and Airbus have two motivations for such strategies. The first is to increase efficiencies by seeking the best suppliers—regardless of location. The second is to persuade prospective buyers (such as nationally-

owned airlines) to purchase their planes. For the suppliers, and more specifically, their governments, this is an opportunity to build an aerospace and defense industrial base. In June 2006, Airbus selected a site in Tianjin as the best location in China to assemble aircraft.⁷⁵ Airbus forecasts that China will order more than \$230 billion in new aircraft by 2023. Since the centrally-controlled ordering process is highly-politicized, Airbus is betting that building aircraft in China (and the technology transfer that goes with it) will strengthen its position vis-à-vis Boeing. For China, this is part of an industrial strategy to build its aerospace and defense sector since, as discussed earlier, there are close links between the two.

While allocating production or assembly operations to foreign companies has become a requirement to make sales abroad, the sharing of technologies makes this an extremely sensitive issue. Understandably, DoD does not want state-of-the-art technologies to fall into the hands of potential adversaries, and so (along with Congress) places limits on what technologies can go abroad and to which countries. This puts defense companies in a very awkward position—if shared technologies fall into the wrong hands, firms will be in trouble with the Pentagon; if restrictions on technology sharing are too tight, it will be difficult to consummate a sale to a foreign government. This issue has irritated participants in the F-35 Joint Strike Fighter (JSF) program.⁷⁶ Originally designed to satisfy the requirements of the U.S. Air Force, Navy, and Marines, the \$276 billion program was too expensive for the United States to undertake on its own. Eight countries agreed to participate in the program, with the expectation that their financial contributions would permit them to have access to the plane's technology

(especially computer codes that would enable upgrades to be done without U.S. help), so that they can support and maintain the aircraft during its 30- to 40-year service life. By the end of 2006, Australia, Canada, Denmark, Italy, the Netherlands, Norway, Turkey, and the UK need to sign agreements committing them to production, but nearly every participant has threatened that their participation in production is dependent on sharing of technology. The United States insists that the JSF, whose design, development, and production is managed by Lockheed Martin with substantial assistance from Northrop Grumman and BAE, will consist of two versions: one for the United States and one for export. The UK, which already has committed \$2 billion in development money to the JSF program and plans to buy 150 of the planes, is particularly upset about this outcome. Given its support for the wars in Iraq and Afghanistan, the British government feels that their country is entitled to the highest levels of technology transfer and has threatened to pull out of the project if it is not treated as an equal partner.⁷⁷

Despite the pressures of globalization, political obstacles still can distort the economics of armaments production. EADS is demanding that the British government guarantee the company a greater share of defense and aerospace contracts in exchange for its continued investment in the UK, now that BAE has sold its 20 percent stake in Airbus.⁷⁸ Given that EADS trails BAE and even Thales and Finmeccanica in terms of defense sales in the UK, London may have to show more interest in EADS if it wants to ensure that thousands of its citizens will continue to have jobs supplying EADS with Airbus wings and other products.

INTERNATIONAL TRADE

A key component of globalization is the promotion of international trade by reducing tariffs and other national barriers. The WTO has been the major global forum for reducing trade barriers. In 2005, world exports of merchandise totaled \$10.1 trillion, representing a 10 percent annual increase since 2000.⁷⁹ Exports of commercial services also jumped by a 10 percent annual rate over this period, reaching \$2.4 trillion in 2005. In addition to this 149-member body, the WTO estimates that almost 300 regional trade agreements are operating or under negotiation. Bilateral agreements also have increased over the past decade. While the trade of armaments largely is excluded from such arrangements, defense-related products (including dual-use goods) often are not. The globalization of trade also has made it easier for certain types of weapons (such as small arms) to be traded. Also, firms like United Technologies that produce for both military and civilian markets are susceptible to increased global competition on the civilian side, even as the military side of their business may be fairly protected. Nonetheless, such firms may be forced to respond by restructuring, selling divisions, reducing workforces, or ultimately going out of business—which could seriously affect the defense industrial base.

As a major driver of globalization, technology is particularly important to the defense industry. Despite attempts by U.S. defense firms to stay technologically ahead of potential adversaries, there is reason to believe that the technology gap closes more quickly now than in previous decades. Increasing U.S. concerns about technology transfer may be a logical response to globalization, but it has created frictions with allies

participating in the Joint Strike Fighter and other programs. This example highlights the tensions that may arise in devising policies to address components of globalization (e.g., technology, trade, and production) that have disparate effects on a particular industry. Technology even has changed the composition of defense industry rankings, with “nontraditional” firms like L-3 Communications, Science Applications International, and Computer Sciences Corp. now among the top U.S. firms in terms of defense revenues.

One consequence of increased international trade is a corresponding increase in demand for natural resources and raw materials. Global economic growth in recent years, particularly in booming economies like China, has increased the demand for commodities. During the summer of 2006, oil reached \$78.40 a barrel, nickel surpassed \$26,000 a ton, and copper topped \$8,000 a ton—all records in nominal terms.⁸⁰ The defense industry, which uses many of these commodities, particularly specialty metals, has borne increased costs as a result of the competition with other industries for supplies. Boeing, for one, is engaged in an accelerated effort to improve productivity to combat the impact on its profitability from rising prices for aluminum, titanium, carbon fiber, and copper.⁸¹ Lightweight resilient metals such as titanium have wide application in aircraft, tanks, and armored vehicles. Such concern prompted the Pentagon to launch an investigation into whether metal prices could affect the price of large-scale weapons systems.⁸² In Congress, a version of the 2005 defense bill raised concern over “increasing reliance on foreign sources of supply” for weapons programs, and the House armed services committee recommended that the Pentagon review stockpiles to ensure the military had proper access to those materials.

In response to these trends, China has opted to increase its trade and investment ties with Africa, which is home to many minerals used in industrial production, including oil. In fact, China's rapidly expanding economy has made it the world's second largest oil importer behind the United States. China-Africa trade has nearly quadrupled since 2001, catapulting China to become the continent's third biggest trading partner behind the United States and France, and there are some 900 Chinese investment projects in Africa.⁸³ About 78,000 Chinese workers are in Africa, many working on oil, mining, and infrastructure projects. Oil companies Sinopec and CNOOC have made major investments in countries like Nigeria and Angola, and Africa supplies almost a third of China's oil imports.⁸⁴ To the extent that China may be a major national security concern for the United States over the course of the 21st century, Beijing's efforts to secure supplies of oil, raw materials, and other commodities on the world market will impact the costs for U.S. defense firms (and the prices that the Pentagon and other buyers will be forced to pay). Of course, China's weapons exports to Africa, such as the 12 military aircraft sold to the repressive government of Zimbabwe in 2005-06, represents an entirely different set of U.S. national security concerns.⁸⁵

While increased global economic activity has led to increased competition for certain industrial inputs, in many cases it also has forced down the prices of finished goods. Some of these goods are, in turn, inputs into weapons systems, thereby lowering the prices of these products. For example, flat-screen panel prices have dropped by 25-30 percent in the 12 months to July 2006 due to global oversupply.⁸⁶

The global arms trade is not governed by WTO rules, since a country cannot be prevented from taking

actions that it considers necessary for the protection of its essential security interests. But the same forces of globalization that have facilitated the trade of “nonarms” goods and services—multinational supply chains, complex transportation logistics, penetration of new markets, and innovative financing—also have helped the weapons industry. A more complicated issue is the trade of dual-use goods, or goods that can be used for both civilian and military applications. In the summer of 2006, the United States proposed to tighten controls on the export of high technology goods to China.⁸⁷ While China obviously was disappointed by the Department of Commerce’s plans, U.S. industry is expected to mount a strong protest, arguing that foreign competitors are not bound by the same restrictions on transfer of civilian technology.

Like the foreign investment trends discussed above, the effects of increasing international trade flows affect defense companies in multifaceted ways. But perhaps the most intriguing is the increasingly complex manner in which they are interconnected. If firms want to enhance their opportunities to diversify their sales base by penetrating foreign markets, simply building weapons and related products in their home country will no longer cut it. As a result, one option is to build alliances with strategic partners. This strategy helps defense companies offset the disadvantage of not being a native firm.

For example, European governments are showing a growing inclination to procure weapons from European companies, which is upsetting some U.S. defense firms that often could rely on steady sales to U.S. allies. Airbus’s military subsidiary beat Boeing and Lockheed Martin to win a €20 billion contract to supply seven European countries with 180 new

military transport aircraft – the A400M.⁸⁸ The A400M, due into service in 2009, is the first time Airbus has undertaken an all-new project in the defense market.⁸⁹ But the most important test for Airbus came in January 2004, when the UK Ministry of Defence opted to spend \$23 billion on refueling aircraft from EADS.⁹⁰ The 27-year contract was a major blow to Boeing, which has a near monopoly on tanker aircraft, and to BAE, which had teamed up with the U.S. firm in the expectation that they would win the competition. The EADS-headed consortium included Rolls-Royce, which will manufacture the tankers' engines, and Thales, which will produce much of the avionics in factories in Britain. Losing the UK contract would have effectively shut Airbus and EADS out of the tanker market. While the actual factors determining the outcome of the decision may never be known, it is likely that national industrial issues played a major role. The Airbus-led team, AirTanker, emphasized that its A330s are built partly in the UK, and half of all new planes and 90 percent of conversions of the old aircraft used for their bid will be built in the UK. AirTanker claimed that 7,500 jobs would be added or sustained if their bid was picked, while Boeing's team could claim just 5,000.

LABOR

Globalization has impacted labor, too. Highly-skilled workers are sought by technology and other high-value-added firms, especially those in the defense sector. In many cases, globalization has made these workers more mobile than ever before, and in those cases where mobility is restricted, companies have come to them.

There is considerable debate over the extent to which the United States is experiencing a skills gap.

According to the National Science Foundation, more than 40 percent of scientific and engineering talent will leave the U.S. workforce in the next decade or so.⁹¹ More than 50 percent of U.S. computer scientists and nearly a quarter of its science and engineering workforce are from abroad. Entrepreneurs from China and India accounted for almost one-third of high-tech start-ups in Silicon Valley in the 1990s. Currently more than half the graduate students in engineering in the United States are foreign born.⁹² Half of China's college graduate earn degrees in engineering, compared with only 5 percent in the United States. South Korea, with one-sixth the population of the United States, graduates about the same number of engineers as U.S. universities do.⁹³ Results from the 2003 Trends in International Mathematics and Science Study showed U.S. fourth-graders were outperformed by only three countries (Taiwan, Japan, and Singapore) in both math and science, but that eighth-graders were outperformed in both fields by seven countries (Chinese Taipei, Japan, Singapore, Hong Kong, South Korea, Estonia, and Hungary).⁹⁴ U.S. eight-graders ranked 15th (out of 45 countries) in math and tied for ninth in science. There seems to be no shortage of reports that the United States is falling behind in its ability to educate and train its own citizens for the high-tech workplace of the 21st century. Part of the explanation behind the "falling behind" scenario is that developing countries have devoted large amounts of resources in recent years to bring up the average education level of their citizens, so U.S. students have not so much been doing more poorly than previous generations of U.S. students, but students in other countries are catching up quickly to U.S. levels. But the consequence of this shift is that workers in other countries will soon become as skilled

and trained as U.S. workers, thereby reducing labor advantages that the United States has long held.

On the other hand, other studies suggest that the skills shortage may be less severe. For example, in proportion to its population, the United States conferred 55 percent more computer science, information technology (IT), and engineering degrees than China, and almost four times more than India.⁹⁵ A survey by the consultancy McKinsey revealed that the pool of Chinese engineers suitable to work for multinationals is about 160,000, less than one-third of the graduates.⁹⁶ Similarly, while three million students graduate from Indian universities each year, only about 25 percent of engineering graduates and 10-15 percent of general college graduates are considered suitable for direct employment in the offshore IT and business process outsourcing industries, according to a study by India's National Association of Software and Service Companies. The consequence of such shortages is that highly skilled workers, particularly in engineering and the sciences, are in high demand everywhere—the United States, Europe, China, and India. The competition among companies to hire and retain such workers is likely to be fierce in the short to medium term.

Regardless of where the United States stands in its ability to generate a highly skilled workforce, it is clear that such talent is in high demand throughout the world. Other developed countries, such as Australia and Canada, have become aggressive acquirers of talented immigrants and students. Developing countries, including Taiwan, Korea, India, and China are trying to retain talented workers and lure expatriates back home by increasing investments in science and offering better pay and opportunities.⁹⁷ However, in the United

States and most European countries, there has been a backlash against immigration in recent years. Indeed, the “immigration debate” almost certainly has been the most discussed domestic policy issue in the United States in 2006.

According to the National Science Board, one-fourth of all college-educated workers in science and engineering occupations in 2003 were foreign born.⁹⁸ This figure rises to 40 percent for doctorate degree holders in these occupations, and even higher in some fields like computer science (57 percent), electrical engineering (57 percent), and mechanical engineering (52 percent). Despite these high numbers, it often is difficult for U.S. firms to hire foreign workers in engineering and the sciences, given the procedures implemented since the 9/11 attacks. Hiring foreign workers, including those attending U.S. universities, is important particularly to technology-oriented firms, since numerous studies show serious math and science deficiencies among native-born U.S. students. Craig Barrett, chairman of Intel, argues that it is increasingly difficult to get foreign students into our universities because of security concerns and improved education options in their own countries.⁹⁹ Those foreign students who are allowed into the United States and complete their studies are returning home in ever greater numbers because of visa issues or better employment opportunities. The H1-B visa program, which provides a process for granting admission or permanent residency to foreign engineers and scientists, currently is capped at 65,000 people per year and is oversubscribed. Intel’s Barrett, among other technology leaders including Microsoft’s Bill Gates, have criticized the restrictions on foreign workers, including a cap of 140,000 on the number of green cards that allow permanent employment, and long processing delays meaning waits up to 7 years.¹⁰⁰

The defense industry is insulated partly from some of these problems. Many high-tech companies, if faced with a lack of engineering and science workers in the United States, can simply go to those locations where such workers are more abundant. But given the national security concerns associated with the defense sector, it is more difficult (although not impossible) to move research and development (R&D) abroad. In any case, if there is a limited talent pool within U.S. borders, defense industry firms at the least will be forced to allocate greater resources to attract and retain such workers.

Yet statistics show that where and how R&D funds are spent can be a critical source of economic competitiveness. According to the National Science Foundation (NSF), federally funded R&D totaled \$127.6 billion in 2006, of which \$74.8 billion, or 58.6 percent, was allocated for national defense (including DoD's military activities, Department of Energy's [DoE] atomic energy defense programs, and defense-related R&D of Department of Homeland Security [DHS]).¹⁰¹ In its most recent projections, the NSF expected total R&D in the United States to amount to \$312.1 billion in 2004, with \$199.0 billion coming from industry, \$93.4 billion from the federal government, \$11.1 billion from colleges and universities, and \$8.6 billion from other nonprofit institutions.¹⁰² R&D expenditures as a percentage of gross domestic product (GDP) have ranged between 2.5-2.7 percent annually over the past decade. As a percentage of GDP over the period 2000-03, the United States ranks sixth (behind Israel, Sweden, Finland, Japan, and Iceland) and slightly ahead of South Korea, Switzerland, Denmark, and Germany. The increasing economic influence of Asia is evident in R&D spending. According to a United Nations Education,

Scientific, and Cultural Organization (UNESCO) 2005 report, Asia's share of global research spending rose from 27.9 percent in 1997 to 31.5 percent in 2002, the most recent year for which reliable figures were available.¹⁰³ Over the same period, Europe's share fell from 28.8 percent to 27.3 percent, and North America's from 38.2 percent to 37.0 percent. Finally, according to the European Defense Agency, participating member countries (all 25 EU members except Denmark) are expected to spend €2.3 billion on defense research and technology in 2006—about 1.3 percent of total defense expenditure.¹⁰⁴

While the international comparisons are favorable toward the United States, one important element is where the R&D funds are being spent. Increasingly, U.S. dollars are being spent overseas in centers in China and India, according to an annual report by the Battelle Memorial Institute and R&D Magazine.¹⁰⁵ While U.S. companies can deduct expenses for R&D to reduce their U.S. tax obligations, actual research and development can take place anywhere in the world. Thus, companies can deduct expenses for R&D undertaken at overseas offices and laboratories. IBM opened an “innovation center” in China during 2004 that will double the size of its existing IBM China Research Lab, and about one-third of Microsoft’s 700-person research division are located outside the United States. Data on the offshoring of R&D is anecdotal at this point, since data are not available on how much R&D U.S. companies are conducting abroad. For companies in the defense industry, this trend is a potential problem since they will be under competitive pressure to utilize foreign research knowledge but will face significant restrictions by DoD.

To the extent that national economic competitiveness in general, and a thriving defense industry in

particular, is built upon a well-educated and skilled workforce, governments and companies will need to devise policies that ensure they have among the best pool of talent in the world. While the international mobility of workers has yet to catch up to the mobility of companies, globalization gradually is leveling this playing field.

GLOBAL GOVERNANCE

Finally, efforts to regulate, control, or deal with globalization (often referred to as “global governance”) provide opportunities for policymakers to try to harness globalization in ways that will support national interests. Governance can take such forms as the creation of international organizations, developing public-private partnerships, industry self-regulation, or involving a variety of stakeholders in policy formulation and implementation. Governance approaches taken by the United States either generally or on an adhoc basis will have implications for the defense industrial base since the actions of these companies will be bound by such decisions. Of course, globalization affects the defense industrial base of all countries, and some will benefit from these changes while others will not. How other countries’ defense industries change in response to globalization will, in turn, affect the U.S. defense industrial base.

One of the more contentious post Cold War issues is the role of international organizations.¹⁰⁶ Globalization has given rise to the need to address problems that are beyond the competences of individual nation-states. International organizations such as the WTO, UN, and the EU have filled part of the governing gap with respect to trade, finance, environment, and other

issues. At the same time, these organizations have been criticized for being unaccountable, undemocratic, and exclusive, and for undermining national sovereignty. These issues came to a head for two international organizations that have been involved in two major events in the recent history of Airbus and Boeing.

The first instance was in 1997, when the EU's competition authorities vetted the Boeing-McDonnell Douglas merger.¹⁰⁷ Although U.S. authorities had approved the merger, the EU ruled that the merger would hurt competition in the EU and demanded that Boeing make three changes to the terms of the merger. Boeing at first argued that the U.S. Federal Trade Commission, not the EU, should take the lead in investigating the deal. When the EU went ahead with the investigation, Boeing made minor concessions. When an EU merger panel voted unanimously that the EU block the merger, Boeing made last-minute concessions to satisfy EU concerns.

The incident was significant for several reasons. First, while the EU had a modest influence in setting conditions on prior mergers between two U.S. companies, this was by far the most aggressive stand that the EU had taken in such matters. Second, political leaders ranging from President Bill Clinton and Vice President Al Gore to France's President Jacques Chirac strongly advocated the position of their respective companies and regulatory authorities. Third, the EU's position was seen widely in the United States as an attempt to protect Airbus. Similar concerns were raised in 2001 when the EU blocked General Electric's proposed merger with Honeywell. Rightly or not, any EU policy decision, particularly in the realm of competition policy that affects aerospace, will be viewed in the United States as an industrial policy

aimed at supporting Airbus. But the larger point is that the deepening of integration in Europe over the past 20 years has transferred more regulatory powers from national authorities to the EU, and companies around the world need to be aware of how such institutional changes can affect their business.

Over the past 2 years, governments in the United States and Europe have raised the stakes by bringing their dispute over subsidies for Airbus and Boeing to the WTO. In May 2005, the U.S. Government announced that it would challenge European government subsidies to Airbus within the WTO. The next day, the EU filed a similar charge against U.S. Government aid to Boeing. The event that precipitated the U.S. Government action was an Airbus request for aid to support the development of a new aircraft—the A350—that is aimed to compete with Boeing's 787 *Dreamliner*. However, U.S. and European officials were headed for such a showdown for years.

The United States long has accused European governments of providing subsidies, specifically loan guarantees, to Airbus. The main objection by U.S. officials is "launch aid" that is provided by European governments to Airbus. Launch aid is money given to Airbus partners to develop new plane models. The money is repayable once planes are sold to airlines. But this delay can be several years, and include development, testing, and actual manufacturing. According to one estimate,¹⁰⁸ European governments have spent \$25 billion on Airbus since 1970, while Boeing's former president and chief executive officer Harry Stonecipher contends that European launch aid to Airbus over the years has allowed the company to avoid \$35 billion of debt it would have occurred by borrowing money commercially.¹⁰⁹ The U.S. position

is that launch aid reduces risk for Airbus since, presumably, the model it supports could prove to be a failure once it comes to market. Airbus would be unable to repay the aid and, the complaint goes, European governments would be pressed to forgive the loan. The A380 superjumbo benefits from a loan of \$3.7 billion, which will not have to be repaid should Airbus fail to sell more than 500 of these planes.¹¹⁰ However, Airbus, European governments, and the EU respond that Airbus has repaid previous loans. The United States contends that this kind of support contravenes WTO rules forbidding direct government subsidies of specific companies or industries. The U.S. House of Representatives went so far as to pass a bill in December 2005 banning the Pentagon from buying any equipment from a company involved in a subsidies dispute with the United States in the WTO.¹¹¹ The provision later was dropped during House-Senate negotiations, but it illustrates the animosity that many U.S. political leaders hold toward Europe, and the protective measures some will take to ensure that the Pentagon “buys American.” (Airbus is hoping to win a contract to supply the U.S. Air Force with in-air refueling tankers.)

A 1992 agreement limited the amount of aid that both sides could provide to their respective aerospace company. For Airbus, aid would be limited to one-third of development costs, while Boeing’s support from the U.S. Government would be limited to 4 percent of sales. This agreement began to unravel once Airbus approached Boeing’s market share, and the European company’s success over the past few years persuaded U.S. officials to abandon the 1992 agreement and negotiate with the EU to phase out launch aid for Airbus. When these talks produced no results, in part

because the Europeans demanded that a subsidy paid by the Japanese government to a consortium making wings for Boeing's 787 *Dreamliner* be included in the negotiations, the United States took "the nuclear option" by bringing the dispute to the WTO.¹¹² A resolution within the WTO may very well find both sides at fault and lead to an outcome that is far less satisfying than bilateral negotiations could produce. That, in effect, is what happened when Brazil's *Embraer* and Canada's *Bombardier* went to the WTO in 1996 to dispute claims of government support for each regional jetliner manufacturer. The organization ruled that both governments violated international trade rules. Each country threatened to implement more than \$3 billion in retaliation, however neither has acted.

In their response, the EU claims that Boeing benefits from the spillover effects of contracts obtained from the Pentagon and National Air and Space Administration. As a result, Boeing's R&D subsidies are worth \$23 billion in the past 13 years.¹¹³ The EU also argues that U.S. state and local governments provide aid to Boeing in the form of tax breaks and other indirect support. For example, in 2001 when Boeing reviewed locations to move its corporate headquarters, Dallas offered millions of dollars of tax breaks and other incentives, and Denver offered \$13-18 million. But both ultimately lost to Chicago's package of \$41 million of state incentives over 20 years. While incentives were not the only factor in Boeing's decision, their impact was not negligible and strengthens the EU's case.¹¹⁴ Washington state, the home of Boeing before the company moved to Chicago and still the home of much of its manufacturing, has provided significant support over the years, and Kansas provided aid for the 787 *Dreamliner*. In all, Boeing is expecting to receive about \$6 billion in government

launch aid for the 787, including a \$3.2 billion tax reduction for production in Washington state and support from the Japanese and Italian governments for wing and fuselage production.¹¹⁵

While the crux of the U.S. argument is that Airbus received launch aid that helped it to develop new planes while Boeing did not, it is not necessarily the case that this put the U.S. company at a disadvantage. As one observer notes, “[a]t no point in the past decade was Boeing unable to fund new aircraft. Its balance sheet was strong. It simply chose not to spend its cash on jetliner development, giving Airbus a strong product advantage.”¹¹⁶ Boeing’s commercial R&D spending did not increase after the 777 jetliner development ended in the mid-1990s. Thus, the EU could argue that Boeing’s misfortunes were self-inflicted due to shortsightedness with regard to changes in the market and customer preferences.

The decision by the United States and EU to take the aerospace subsidies dispute to the WTO underscores the inability of officials on both sides to resolve a growing number of trade disputes. The other major transatlantic trade dispute involves U.S. use of subsidies for exporters, with Boeing (which receives about \$200 million annually from this program, according to the EU) being one of the two top recipients of this program. The WTO determined in 2002 that this Foreign Sales Corporation and Extraterritorial Income (FSC-ETI) tax system violated international trade rules, and authorized the EU to impose penalties on U.S. exports totaling \$4 billion.¹¹⁷ Under pressure from U.S. companies who were penalized when the EU began imposing WTO-approved tariffs in March 2004 starting at 5 percent and increasing by 1 percent monthly, the U.S. Congress revised the FSC-ETI system in October

2004, but instituted a range of other tax breaks totaling \$137 billion in its place.¹¹⁸ The EU again complained to the WTO, which ruled that the new tax breaks were also in violation of trade laws. Reports that the EU was considering leaving some portion of the sanctions in place and targeting the penalties directly at European imports of Boeing aircraft to punish the company for backing the WTO complaint against subsidies to Airbus (a complaint initiated by the United States in October 2004) drew a sharp rebuke from U.S. trade representative Robert Zoellick for linking the two issues.¹¹⁹

Not surprisingly, the WTO is a lightning rod for a range of critics, from economic protectionists to environmentalists and labor activists, and opponents of globalization. Drawing aerospace into this whirlpool of criticism certainly is not helping to improve transatlantic relations or support in the United States and EU for international organizations. However, the WTO is perhaps the symbol that best represents globalization and its corresponding processes, and its objective of reducing trade barriers provides the organization with support from countries and companies that benefit most from these principles.

Global governance also encompasses issues requiring international cooperation through less-institutionalized forums than the WTO. This is particularly true when defense industrial issues are part of a wider international economic relationship.¹²⁰ For example, the EU imposed an arms embargo on China after the 1989 Tiananmen Square massacre. But by late 2004, Beijing was placing heavy pressure on European governments to lift the embargo, arguing that China has changed since 1989 and should not be lumped with other pariah countries like Burma,

Sudan, or Zimbabwe. Chinese officials even suggested that Sino-European trade could be affected adversely if the embargo was not lifted. In 2005, the EU accounted for 16.4 percent of China's total foreign merchandise trade—ahead of both the United States (16.0 percent) and Japan (13.9 percent).¹²¹ European companies have been very successful in China: Volkswagen makes the country's most popular brand of cars, and Siemens is the biggest foreign employer in China. And, given the growth of China's economy, Airbus hopes to sell billions of euros worth of aircraft over the next couple of decades. At the same time, U.S. Government officials contend that, should the embargo be lifted, the United States would erect firewalls when considering defense sales to Europe, and would take into account whether a European company wanting sophisticated U.S. technology had any links with China.¹²² Although the EU member countries could not reach agreement in December 2004 on lifting the ban, intense lobbying pressure from European companies in almost all sectors, including defense, and the national leaders who benefit from the success of home-grown companies that gain from an economic relationship with China, will keep this issue alive in the coming months.

CONCLUSIONS AND RECOMMENDATIONS

Globalization, in many ways, has strengthened the hand of defense companies at the expense of national governments. With more opportunities to expand their international presence, governments, at times, are being required to make concessions that would have been unheard of even a decade ago. With the Pentagon and ministries of defense in a monopsonist position (i.e., being the only buyer), defense firms, which were

very much oriented around a national production and finance base, depended on receipt of weapons contracts from their home governments, often in the face of intense competition with other firms in the industry. Of course, international arms sales were present and often vital for a company's success, but exports almost always were secondary, since they were a way to increase production runs, capitalize on learning from manufacturing processes for the home market, and lower overall per-unit costs.

But today many companies are looking at foreign markets much sooner—or even instead of home markets. BAE is perhaps the best example of this. With probably the most open defense procurement markets in the world, the UK often has awarded contracts to foreign companies instead of its own national champion—BAE. According to a December 2005 White Paper, the UK Ministry of Defense placed 5 percent of its 2004-05 spending on imports, 14 percent with foreign-owned UK-based companies, and 13 percent on cooperative European programs.¹²³ In contrast, the United States spent less than 2 percent on imports and 7 percent with foreign-owned companies. With BAE generating an increasing percentage of its sales abroad and even considering moving its corporate headquarters to the United States, the British government revised its policy in early 2006. The Ministry of Defense now promises to make BAE the government's partner of choice for air, land, and sea weapons procurements.¹²⁴ The new more cooperative relationship ensures the preservation of an indigenous defense industrial base, a serious government concern, and provides BAE with an understanding that more contracts with the Ministry of Defense will be forthcoming.

Nigel Whitehead, head of BAE's fighter jet business, probably sums up the views of many defense industry

executives—U.S. and foreign—when he says, “The sentimental engineer in me wants to be in the UK. But if you look at the cold reality of corporations, we have to determine the best markets in which to invest shareholders’ money.”¹²⁵ The increasing difficulty of reconciling national loyalties and international business opportunities has been the main point of this monograph.

Given the effects that globalization has had on national industrial bases around the world, the following recommendations should be considered as appropriate means to enhance U.S. national security. However, given the scope of globalization and the multiple actors and dimensions that underpin it, it is beyond the ability of the U.S. Army or even DoD to shape its direction, even as globalization relates to the U.S. defense industrial base. The recommendations should be viewed, then, as multilayered, with different roles for the private sector and the various branches, departments, and agencies of the federal government (indicated in parentheses).

1. Monitor international production patterns of leading U.S. defense industrial companies (DoD). While it is fairly clear why defense firms are internationalizing their production base, especially those dependent to a greater degree on revenues from civilian products, there is serious reason for concern that the flow of critical technologies to Japan, China, and other current and potential powers could have adverse consequences for U.S. national and economic security in the medium to long term. DoD officials should consider stipulating that the 30 largest defense contractors must submit an annual report describing the extent of their international production and R&D, including their leading suppliers. The information

would give defense officials an understanding of the extent to which offshore sites are involved in critical technologies and production. The proposal is not meant to discourage the internationalization of companies, but simply to give the Department information that will allow it to determine whether, collectively, the global activities of the U.S. defense industrial base are a national security concern.

2. Make the approval process for foreign acquisitions more transparent (Executive and Legislative branches). In the wake of the CNOOC and especially Dubai Ports World controversies, it is clear that a more transparent process should be devised to determine whether acquisitions of U.S. companies pose a risk to national security. The CFIUS, currently comprised of mid-level, department-protecting government officials, should consist of higher-ranking (even cabinet level) officials and perhaps independent experts and even representatives from each chamber of Congress. Particular attention should be given to deals in which foreign companies are owned entirely or substantially by their governments.

3. Take a proactive stance in terms of investment in the United States by foreign defense companies (DoD). It is in the best interest of the military and DoD to have greater procurement options. Given appropriate safeguards with respect to technology transfer, there is little downside to purchasing weapons from U.S. affiliates of foreign companies. When there is opposition to inward investment from Congress, the media, or industry, the Pentagon and relevant military branches should take a proactive stance to influence decisionmakers and opinion-formers through formal and informal channels of communication.

4. Give preference to foreign companies with U.S.-based production when awarding contracts (DoD).

Foreign defense companies should not be penalized in the arms procurement process if they have a substantial investment in the United States. Foreign firms with high levels of U.S.-based production and employment (including high-skill jobs) should be given preference over other foreign bidders, and even U.S. firms that may be planning to do significant amount of the work offshore. If DoD's objective is to ensure the stability of the U.S. defense industrial base, the focus should be on how much of a contract's work (including R&D production) will be conducted within the United States. Given that workers will remain less mobile than companies for the foreseeable future, employment of U.S. workers—rather than the nationality of bidding firms—should be given higher priority.

5. Be judicious in restricting technology transfer (DoD). While there clearly is concern that globalization is facilitating the transfer of sophisticated technology to potential adversaries, the U.S. Government needs to be more judicious in exercising controls. Most of the partners in the JSF program are reliable allies, and strained diplomatic relations over this issue are not worth the marginal benefit of restricting the transfer of computer codes and other technologies related to this aircraft. The assumption that the United States always will be on the leading edge of technology is false. As the increasing competitiveness of other countries is making clear, it is very likely that a greater number of innovative technologies with military applications will come from abroad. It is important, then, that DoD and other government bodies seeking to control technology transfer realize that globalization is making this process a “two-way street.”

6. Diversify into nondefense sectors (Defense companies). U.S. defense spending has grown an

average of 9-10 percent in each of the past 5 years. Even with the ongoing wars in Iraq and Afghanistan and the challenges of global terrorism, spending is expected to fall to 3-4 percent annually, below the level of inflation in military equipment costs. Jim Albaugh, head of Boeing's defense business, argues that "too many capabilities are chasing too few dollars," and that expensive programs will be cut back, underperforming projects cancelled, and new weapons development suspended.¹²⁶ Lockheed plans to build its information technology business, which it hopes eventually will account for two-thirds of revenues. This includes not only battlefield systems, but IT services to the government and even the healthcare market. Thus, firms should avoid over-investing in the defense side of their business. This will result in two advantages. First, it should allow companies to maintain strong balance sheets, which will allow them to take advantage of opportunities at home and abroad (including cross-border acquisitions). Second, it will help in technology transfer, since many of the more innovative technologies today originate in civilian-oriented business activities.

7. Improve math and science education (Federal, state, and local government). In terms of skills, more needs to be done to improve the U.S. educational environment, particularly in math and science at all levels. The Congress-authorized National Academies Committee recommended that the government create 25,000 undergraduate and 5,000 graduate scholarships in the amount of \$25,000 in technical fields, especially those determined to be in areas of urgent "national need."¹²⁷ The Committee also recommended a tax credit for employers who make continuing education available for scientists and engineers, and a sustained national commitment to basic research. Building a

skilled indigenous workforce is essential not only for national security, but for national economic competitiveness as well.

8. Rebalance security concerns with economic competitiveness in areas of scientific research (Federal government and universities). In the current environment, there is reasonable justification to evaluate fully the backgrounds of foreign students, scholars, and researchers who attend or work at U.S. universities. But there seems little to be gained by burdening universities with additional layers of administration in this area. In July 2005, DoD proposed new security restrictions on access by foreign researchers to sensitive technology useful to national security, including segregated university laboratories. The Department of Commerce created a committee to study this issue in May 2006. After intense pressure from universities, both departments backed off their proposals, with DoD agreeing that its original version was "overly prescriptive."¹²⁸ Since foreign researchers and students had to go through a visa approval process to come to the United States in the first place, it is not clear that a second vetting process is necessary to determine whether they are a risk in sensitive research. Since globalization shortens the lead time that companies have to develop innovative ideas and products, it is critical that the United States remain a leader in cutting edge technologies.

9. Ease restrictions on foreign high-skilled workers (Federal government and defense companies). The process whereby foreigners obtain permission to work in the United States needs to be revamped. While it is important to give appropriate weight to security concerns, the economic argument that highly-trained foreign workers can spur economic growth generally,

and innovations in high-technology (including the defense sector) in particular, must be given greater attention. The number of permanent visas for highly educated foreigners should be increased, as should the visas that permit foreign students to matriculate at U.S. colleges and universities. The U.S. higher education system is envied by many around the world, and should be used as a recruiting tool to attract capable foreigners. From an economic and national security standpoint, it makes little sense to instill knowledge into foreign students, and then send them to their home countries to take up jobs where they compete with workers born in the United States.

10. Work with global institutions to harness the benefits of globalization (Various federal departments and agencies and defense companies). The EU and WTO are, along with the UN, the most complex, sophisticated, and high-profile organizations in the world. Conflict between these organizations and the nation-states that have yielded sovereignty and decisionmaking to them is certain to occur. As discussed earlier, the merger approval powers of the EU and the WTO's rules regarding aerospace and export subsidies have sparked skepticism about the motivations and usefulness of these international organizations. It is important to keep in mind that these organizations have benefited U.S. interests more than they have harmed them. EU authorities approve the vast majority of M&As between U.S. companies or U.S.-European ones. Since the mid-1990s, antitrust regulators in Washington and Brussels have worked closely, exchanged information, and strived to reach similar decisions. U.S. companies, including those in the defense industry, benefit from a European organization that is seeking to harmonize the business

environment across its 25 member countries. Likewise, U.S. firms benefit from the market-opening principles of the WTO, even if, as appears increasingly likely, the Boeing-Airbus subsidy controversy results in both sides being unhappy with the trade body's decision. U.S. officials should continue to support and influence the direction of these organizations, rather than pursue a unilateral agenda in transatlantic and international trade and economic matters.

ENDNOTES

1. International Monetary Fund, *World Economic Outlook*, May 1997, p. 45.
2. Francis Fukuyama, *The End of History*, New York: Penguin Books, 1992.
3. Samuel Huntington, *The Clash of Civilizations and the Remaking of World Order*, New York: Simon & Schuster, 1996.
4. World Trade Organization, "Selected Long-Term Trends," *International Trade Statistics 2005*, www.wto.org/english/res_e/statis_e/its2006_e/its06_longterm_e.pdf.
5. Organization for Economic Cooperation and Development, *Trends and Recent Developments in Foreign Direct Investment*, June 2006.
6. Benjamin R. Barber, *Jihad vs. McWorld: How Globalism and Tribalism are Reshaping the World*, New York: Ballantine, 1995.
7. Thomas L. Friedman, *The Lexus and the Olive Tree*, New York: Farrar, Straus and Giroux, 1999.
8. Robert Reich, *The Work of Nations: Preparing Ourselves for 21st Century Capitalism*, New York: Knopf, 1991.
9. Kenichi Ohmae, *The End of the Nation State: The Rise of Regional Economies*, New York: The Free Press, 1995.
10. Thomas L. Friedman, *The World is Flat: A Brief History of the Twenty-First Century*, New York: Farrar, Straus, and Giroux, 2005.
11. Michael Porter, "The Competitive Advantage of Nations," *Harvard Business Review*, Vol. 90, No. 2, 1990, pp. 73-93.

12. David P. Baron, "Integrated Strategy: Market and Non-market Components," *California Management Review*, Vol. 37, No. 2, 1995, pp. 47-64.
13. Norman Augustine, "Reshaping an Industry: Lockheed Martin's Survival Story," *Harvard Business Review*, May-June 1997, pp. 83-94; John J. Dowdy, "Winners and Losers in the Arms Industry Downturn," *Foreign Policy*, Vol. 104, 1997, pp. 88-101.
14. Greg Schneider and Renae Merle, "Reagan's Defense Buildup Bridged Military Eras," *Washington Post*, June 9, 2004, p. E1.
15. *Economist*, "American Business: Boeing gets back on Track," June 2, 2005.
16. Christopher Bowe, "Homeland Defence to give Boost to Northrop," *Financial Times*, May 17, 2004, p. 16.
17. Kevin Done and James Boxell, "Successes bring new Challenges," *Financial Times Special Report: FT Aerospace 2006*, July 17, 2006, p. 1.
18. Terrence Guay and Robert Callum, "Future Prospects of Europe's Defence Industry," *International Affairs*, Vol. 78, No. 4, 2002, pp. 757-779.
19. Kevin Done, "BAE to Push for Sale of Airbus Stake," *Financial Times*, September 7, 2006, p. 24.
20. *Economist*, "Aerospace: New Pilots for EADS," July 8, 2006, pp. 54-57.
21. Adam Jones, "Lagardère Focus Comes Back Down to Earth," *Financial Times*, April 6, 2006, p. 16.
22. James Boxell and Leslie Crawford, "BAE Seeks Details on Airbus Price," *Financial Times*, July 5, 2006, p. 16.
23. Peter Spiegel, "Rationalization Plans Still to Get Off the Drawing Board," *Financial Times*, September 13, 2005.
24. "Naval Shipyards: Pipe Dreams Aboard," *The Economist*, October 28, 2004.
25. Hannes Baumann, "The Consolidation of the Military Vehicles Industry in Western Europe and the United States—Background Paper for the SIPRI Yearbook 2003," 2003, www.sipri.org/milex/aprod/mv_background.pdf.
26. Bjorn Hagelin, Mark Bromley, and Siemon T. Wezeman, "International Arms Transfers," in *SIPRI Yearbook 2006: Armaments*

Disarmament and International Security, Stockholm: Stockholm International Peace Research Institute (SIPRI).

27. Data collected from ORBIS database, August 22, 2006.
28. BAE Systems website, ir.baesystems.com/bae/shareholder_info/foreign/.
29. Chris Flood and Darryl Thomson, "EADS Lifted by Plans for Germany Listing," *Financial Times*, June 8, 2006, p. 28.
30. Organization for Economic Cooperation and Development, *Trends and Recent Developments in Foreign Direct Investment*, June 2006.
31. Thomas W. Anderson and William J. Zeile, U.S. Bureau of Economic Analysis, "U.S. Affiliates of Foreign Companies: Operations in 2004," *Survey of Current Business*, Vol. 86, No. 8, August 2006, pp. 195-211.
32. *Trends and Recent Developments in Foreign Direct Investment*.
33. Lina Saigol and James Politi, "M&A Activity Surging to Record," *Financial Times*, June 30, 2006, p. 17.
34. *Economist*, "Mergers and Acquisitions: Once More Unto the Breach, Dear Clients, Once More," April 8, 2006, pp. 71-72.
35. James Boxell, "EADS Plan for Satellites is 'Good'," *Financial Times*, April 28, 2006, p. 14.
36. James Boxell, "MBDA Prepares for Consolidation," *Financial Times*, March 17, 2006, p. 17.
37. Mark Huband, "BAE Advances on U.S. with \$4bn Purchase," *Financial Times*, March 8, 2005.
38. Renae Merle, "General Dynamics Loses Bid for Britain's Alvis," *Washington Post*, June 4, 2004.
39. Peter Spiegel, "General Dynamics Breaks Off Merger Talks with BAE," *Financial Times*, October 22, 2003, p. 1.
40. James Boxell, "BAE Systems Pursues its Atlantic Devotion," *Financial Times*, August 30, 2006, p. 19.
41. *Ibid.*
42. Stephanie Kirchgaessner, "UK Defence Group among the Top Donors to U.S. Lawmakers," *Financial Times*, August 22, 2006, p. 1.
43. *Trends and Recent Developments in Foreign Direct Investment*.

44. Stephanie Kirchgaessner, "Plan to Rank Nations in Foreign Deals Revamp," *Financial Times*, March 27, 2006, p. 7.
45. Stephanie Kirchgaessner, "Foreign Subsidiaries to Warn on U.S. Bill," *Financial Times*, February 18, 2006, p. 4.
46. Demetri Sevastopulo and Holly Yeager, "Port Deal Reaction is Threat to Economy, Warns Chertoff," *Financial Times*, March 13, 2006, p. 1.
47. Peggy Hollinger, "Thales Signals Hopes of Finmeccanica Link," *Financial Times*, April 6, 2006, p. 15.
48. Yuri Kageyama, "Toshiba Faces Hurdles to Buy Westinghouse," *Mercury News*, February 22 2006, www.mercurynews.com/mld/mercurynews/news/breaking_news/13929445.htm.
49. Stephanie Kirchgaessner, "Foreign Companies turn to Congress to Bless Acquisitions," *Financial Times*, April 24, 2006, p. 1.
50. *Trends and Recent Developments in Foreign Direct Investment*, pp. 1-2.
51. Hannes Baumann, "The Consolidation of the Military Vehicles Industry in Western Europe and the United States—Background Paper for the SIPRI Yearbook 2003," 2003, www.sipri.org/milex/aprod/mv_background.pdf.
52. "India's Defence Industry: The Private Sector to the Rescue," *Economist*, April 6, 2006, p. 43.
53. Amy Yee, "EADS To Set Up Base in India," *Financial Times*, August 30, 2006, p. 16.
54. Dawn Kopecki, "When Outsourcing Turns Outrageous," *Business Week*, July 31, 2006, pp. 54-55.
55. Shawn Donnan, "Indonesian Military to Divest only Six of its 1,500 Businesses," *Financial Times*, June 21, 2006, p. 2.
56. Stephen Fidler, "Beijing 'Has Dangerous Approach to Arms Exports'," *Financial Times*, June 12, 2006, p. 3.
57. Arkady Ostrovsky, "Russia Merges Aircraft Makers into Single State Company," *Financial Times*, February 22, 2006, p. 2.
58. Arkady Ostrovsky and Kevin Done, "Russia to Relax Rules on Foreign Investment in Aviation Industry," *Financial Times*, August 24, 2006, p. 1.

59. Raphael Minder, "Financial Woes could Force EU to Scale Down Galileo Navigation System," *Financial Times*, April 19, 2006, p. 2.
60. Vicki Kwong and Andrea Rothman, "Boeing vs. Airbus: The Next Bout," *International Herald Tribune*, February 16, 2006, www.iht.com/articles/2006/02/16/bloomberg/sxair.php.
61. David Turnipseed, Ali Rassuli, Ron Sardessai, and Carol Park, "A History and Evaluation of Boeing's Coalition Strategy with Japan in Aircraft Development and Production," *International Journal of Commerce & Management*, Vol. 9 No. 1/2, 1999, pp. 59-83.
62. "American Business: Boeing Gets Back on Track," *Economist*, June 2, 2005.
63. "Going Japanese: How Japan learned to fly," *Economist*, June 25, 2005, p. 68.
64. Mariko Sanchanta, "Airbus Moves to Break Boeing's Hold on Japan," *Financial Times*, February 10, 2005, p. 15.
65. "Face value: A New Pilot for Airbus," *Economist*, September 29, 2005, p. 64.
66. George Parker, Jan Cienski, and Raphael Minder, "'Big Three' Urge Poland to Purchase Airbus," *Financial Times*, February 23, 2005, p. 3.
67. Associated Press, "Airbus Surges Past Boeing with \$10B China Sale," *St. Petersburg Times*, December 6, 2005, www.sptimes.com/2005/12/06/news_pf/Business/Airbus_surges_past_Bo.shtml.
68. "Singapore's RSAF Decides to Fly like an Eagle," *Defense Industry Daily*, September 7, 2005, www.defenseindustrydaily.com/2005/09/singapores-rsaf-decides-to-fly-like-an-eagle/index.php.
69. Christopher Swann, "Mandelson Pushes for Swift End to Aircraft Dispute," *Financial Times*, February 12-13, 2005, p. 3.
70. "Face Value: A New Pilot for Airbus," *Economist*, September 29, 2005, p. 64.
71. Kevin Done and Peter Spiegel, "Airbus Seeks Launch Aid for A350," *Financial Times*, January 13, 2005, p. 1.
72. Daniel Michaels, "Flight Plan: Woo Boeing, Airbus," *Wall Street Journal*, February 3, 2005, p. B6.
73. "A Survey of the Company, Partners in Wealth: The Ins and Outs of Collaboration," *Economist*, January 21, 2006, p. 16-17.

74. Peter Pae, "Airbus Superjumbo is a Plane as Big as the Globe," *Centre Daily Times*, January 18, 2005, p. B7.
75. Andrew Yeh and Doug Cameron, "Airbus Studies Plans for Assembly in China," *Financial Times*, June 9, 2006, p. 20.
76. Nick Cook, "Stealth Keeps Secrets Under Allies' Radar," *Financial Times*, July 29, 2005, p. 8.
77. Demetri Sevastopulo and James Boxell, "US Seeks to End Dispute with UK on Fighter Jets," *Financial Times*, March 27, 2006, p. 1.
78. James Boxell, "EADS Demands Commitment on UK Contracts," *Financial Times*, July 17, 2006, p. 19.
79. World Trade Organization, *World Trade Report 2006*, www.wto.org/english/res_e/reser_e/world_trade_report_e.htm.
80. "Commodities: Oil that Glitters," *Economist*, July 22, 2006, pp. 69-70.
81. Kevin Done, "Boeing Acts to Counter Cost of Materials," *Financial Times*, July 20, 2006, p. 16.
82. Nathan Hodge, "Pentagon Studies China's Influence on Price of Weapons Metals," *Financial Times*, June 30, 2005, p. 6.
83. Andrew Yeh, "China Ventures on Rocky Roads to Trade with Africa," *Financial Times*, June 20, 2006, p. 2.
84. David White, "China's Quest for Commodities Leads to Africa," *Financial Times*, June 20, 2006, p. 1.
85. Tony Hawkins, "Harare to Buy more Chinese Aircraft," *Financial Times*, August 24, 2006, p. 3.
86. Kathrin Hille, Anna Fifield, and Michiyo Nakamoto, "Flat-panel Price Fall May Help Producers," *Financial Times*, July 17, 2006, p. 15.
87. Guy Dinmore, "China Anger at U.S. Exports Plan," *Financial Times*, June 27, 2006, p. 4.
88. Peter Spiegel, "Boeing's Main Rival Decides the best Offence is Defence," *Financial Times*, November 19, 2003, p. 16.
89. Kevin Done, "Airbus in a Spin as Investors Punish Delays," *Financial Times*, June 15, 2006, p. 20.
90. Mark Odell, Peter Spiegel, and Caroline Daniel, "Boeing to Lose out on \$23bn Deal," *Financial Times*, January 23, 2003, p. 1.

91. Richard Florida, "A Dire Global Imbalance in Creativity," *Financial Times*, July 20, 2006, p. 15.
92. Craig Barrett, "Why America Needs to Open its Doors Wide to Foreign Talent," *Financial Times*, January 31, 2006, p. 15.
93. *Ibid.*
94. Patrick Gonzales et al., *Highlights from the Trends in International Mathematics and Science Study TIMSS) 2003*, NCES 2005-005, U.S. Department of Education, National Center for Education Statistics, Washington, DC: U.S. Government Printing Office.
95. Guy De Jonquieres, "Asia Cannot Fill the World's Skills Gap," *Financial Times*, June 13, 2006, p. 15.
96. Jo Johnson and Richard McGregor, "Up to the Job? How India and China Risk being Stifled by a Skills Squeeze," *Financial Times*, July 20, 2006, p. 9.
97. Florida, p. 15.
98. National Science Board, *Science and Engineering Indicators 2006*, two volumes, Arlington, VA: National Science Foundation, 2006.
99. Barrett, p. 15.
100. Chris Nuttall, "Intel Chief Calls for Easing of Visa Curbs," *Financial Times*, February 8, 2006, p. 2.
101. National Science Foundation, Division of Science Resources Statistics, *Federal R&D Funding by Budget Function: Fiscal Years 2004–06*, NSF 06-317, Project Officer, Ronald L. Meeks, Arlington, VA, 2006.
102. National Science Foundation, Division of Science Resources Statistics, *U.S. R&D Continues to Rebound in 2004*, NSF 06-306, January 2006, Arlington, VA, www.nsf.gov/statistics/infbrief/nsf06306/nsf06306.pdf.
103. George Parker and Clive Cookson, "EU Urged to put more into Research Spending," *Financial Times*, January 20, 2006, p. 2.
104. European Defence Agency, www.eda.europa.eu/facts/Defence%20R&T%20Spend.htm.
105. Antonio Regalado, "Sharp Rise by Military May Drive R&D Spending," *Wall Street Journal*, January 3, 2005, p. A2.
106. D. Green and M. Griffith, "Globalization and its Discontents," *International Affairs*, Vol. 78, No. 1, 2002, pp. 49-68;

Debra Johnson and Colin Turner, *International Business: Themes and Issues in the Modern Global Economy*, London: Routledge, 2003.

107. Eleanor M. Fox, "Antitrust Regulation across National Borders," *Brookings Review*, Vol. 16 No. 1, 1998, pp. 30-32; Terrence Guay, *At Arm's Length: The European Union and Europe's Defense Industry*, Hounds Mills, UK: Macmillan, 1998.
108. Richard Aboulafia, "The Transatlantic Politics of Aircraft Subsidies," *Financial Times*, November 11, 2004, p. 15.
109. Harry Stonecipher, "Airbus's 'Launch Aid' has to be Grounded," *Financial Times*, September 15, 2004, p. 13.
110. *Economist*, "Airbus and Boeing Trade Blows," June 1 2005.
111. Peter Spiegel, "Congress Kills Pentagon Embargo on Airbus," *Financial Times*, December 20, 2005, p. 1.
112. *Economist*, "Airbus and Boeing Trade Blows," June 1, 2005.
113. *Economist*, "Boeing v. Airbus: Nose to Nose," June 25, 2005, pp. 67-69.
114. James Wallace, "Boeing Picks Chicago; Will move by Sept. 4," *Seattle Post-Intelligencer*, May 10, 2001, seattlepi.nwsource.com/business/22433_chicago10.shtml.
115. Edward Alden and Raphael Minder, "US Seeks Deal with EU to End Aircraft Aid," *Financial Times*, September 16, 2004, p. 3.
116. Richard Aboulafia, "The Transatlantic Politics of Aircraft Subsidies," *Financial Times*, November 11, 2004, p. 15.
117. "Trade: Transatlantic Tiff," *Economist*, March 4, 2004.
118. Raphael Minder, "Peace Offering Fails to Budge Europe on Trade Sanctions," *Financial Times*, October 14, 2004, p. 1.
119. Edward Alden, "Zoellick warns EU on linking trade disputes," *Financial Times*, October 18, 2004, p. 1.
120. Marcus Walker, Marc Champion, and Scott Miller, "EU Maintains China Arms Embargo," *Wall Street Journal*, December 9, 2004, p. A14.
121. World Trade Organization, Table A19, International Trade Statistics 2006, www.wto.org/english/res_e/statis_e/its2006_e/its2006_e/pdf.

122. Guy Dinmore, "US Warns Europeans against Resuming Arms Sales to China," *Financial Times*, December 14, 2004, p. 6.
123. The Secretary of State for Defence, *Defence Industrial Strategy: Defence White Paper*, December 2005.
124. James Boxell, "After the Battle of Britain: How BAE can call itself Champion," *Financial Times*, June 23, 2006, p. 11.
125. James Boxell, "After the Battle of Britain: How BAE Can Call Itself Champion," *Financial Times*, June 22, 2006, p. 15.
126. James Boxell, "Lockheed Plays Down U.S. Defence Budget Fears," *Financial Times*, July 18, 2006, p. 17.
127. Craig Barrett, "Why America Needs to Open its Doors Wide to Foreign Talent," *Financial Times*, January 31, 2006, p. 15.
128. Jeffrey Brainard, "Defense Department Shelves Proposal to Increase Restrictions on Foreign Scientists," *Chronicle of Higher Education*, August 15, 2006, chronicle.com/daily/2006/08/2006081501n.htm.